INTERNATIONAL ABSTRACTS OF SURGERY

VOLUME 84 JANUARY, 1947 NUMBER 1

# COLLECTIVE REVIEW

## THE PARATHYROID ADENOMA

### A Study of 322 Cases[1]

EDGAR H. NORRIS, M.D., F.A.C.S., Detroit, Michigan

SURGICAL management of the parathyroid adenoma holds a place among the recent triumphs of modern surgery. Operative removal of the adenoma is the only effective treatment for this lesion and, because of the striking metabolic and skeletal effects with which the neoplasm is associated, the surgical results are often dramatic.

The entire history of the parathyroids extends through a relatively brief period and is encompassed by no more than 65 years. In 1880, long after the gross anatomists had completed their charting of the organs and parts of the body, the tiny parathyroid glandules were discovered by Sandstrom, a Scandinavian histologist. Eleven years later in 1891, Gley was the first to demonstrate that these glandules were both anatomically and physiologically distinct from the thyroid. From the point of view of clinical medicine and surgery, parathyroid history is even shorter, and a considerable part of the story has been derived from experience gained in dealing with the parathyroid adenoma.

De Santi (1900) and Benjamins (1902) are often credited with having been the first to describe primary tumors of the parathyroid glands; however, in the light of present knowledge their descriptions are not entirely convincing. De Santi did not report on the histology in his case. And the tumor in Benjamins' case was as large as a child's head! What is more, despite the fact that the tumor in both cases was very large, neither author noted the association of any skeletal changes. Several other observers of about the same period (Kocher, 1899; Langhans, 1907; de Quervain, 1909) reported cases of cervical tumors that may have risen from the parathyroids, but, again, the evidence of origin is not clear.

The more secure history of the parathyroid adenoma began about 40 years ago, and during the first 3 decades of the present century scattered reports of some 30 cases appeared in which a parathyroid tumor was found at autopsy. Probably the earliest record of a case that we may today accept as one of a parathyroid adenoma was that presented by Erdheim in 1903. A year later, in 1904, Askanazy was the first to associate a parathyroid tumor with skeletal lesions, and thereafter the combined incidence of an enlarged parathyroid and the lesions of osteitis fibrosa generalisata came to be recognized. However, it was not until after the first surgical removal of a parathyroid adenoma by Mandl, a Viennese surgeon, in 1925, that widespread, practical interest in these related maladies was stimulated. Consequently, the history of the clinical surgery of parathyroid disease is rather recent and has been crowded into the brief period of the last twenty years.

Since Mandl's communication of 1925 there has been a rapidly growing list of case reports and the majority have come from surgical clinics. Up to the present time more than 300 cases have been reported and the available information regarding parathyroid adenomas is considerable. However,

[1] See Appendix.

because no single investigator has had the opportunity to study more than a few cases, it is not surprising that our more accurate ideas have been slow in formulating and that our fundamental and practical knowledge of the parathyroid adenoma has developed gradually. In the present study we have assembled the recorded information and data and have completed a comprehensive analysis that categorically summarizes our knowledge in a manner which may guide us in securing satisfactory answers to those problems which are still unsolved.

### MATERIALS AND METHODS USED IN THE PRESENT STUDY

Adenomas of the parathyroid glands have been reported since 1903. In Table I, we have brought together data from the case reports that have appeared in the literature during the 43 years from 1903 to 1945, inclusive. Table I includes the original and basic data from which the statistical analyses of this article have been derived.

Because this article is concerned with the parathyroid adenoma only, and because at times in the past there has been a tendency to confuse adenomas with hyperplastic states of the glandules, we have criticised each report editorially and have admitted to the tabulation every case that in our judgment could justifiably be included. Even with this degree of critical analysis, as will be pointed out later, a few cases are included among the small group of "multiple adenomas" about which there may be some discussion. These few cases have been dealt with carefully so as not to prejudice the statistical calculations.

Although, of necessity, the data have been compiled from a great many sources, and although the records on certain features are incomplete for many of the cases, we are of the opinion that the quantity of data is sufficient to justify the conclusions reached. For the quality of the records we can assume no more responsibility than to suspect their accuracy whenever exaggerated departures from evident tendencies are noted. In order critically to minimize the application of editorial judgment and to place the greater responsibility upon the original records, each problem has been approached mathematically and from several points of view with the use of illustrative tables and charts.

### STATISTICAL ANALYSIS OF THE RECORDED DATA

*General incidence of the adenoma.* Apparently no exact figures have been published to indicate the incidence of parathyroid adenomas either in groups of individuals or in series of surgical cases.

Of the 322 cases included in Table I, 78.9 per cent of the adenomas were removed at operation and 21.1 per cent were discovered at autopsy (Table II).

*Single and multiple adenomas.* In the total group of 322 cases more than 1 adenoma was found in 20 instances, or in 6.2 per cent of the cases. These may be identified in Table I for a superior 1 (1) has been placed before the serial number of each case of multiple adenomas. Because this group in which more than 1 adenoma was found was small, and since in most of the cases features were present that laid them open to question as true adenomas, they will be considered separately in our further statistical calculations. Before this decision was reached, however, the effect of the inclusion or deletion of this small group was tested and found to be negligible. Their distribution by decades was much like that for the cases of single adenomas (1 is found in the second decade, 1 in the third, 3 in the fourth, 9 in the fifth, 5 in the sixth, and 1 in the seventh). Weights are recorded in only 5 of the 20 cases. Sixteen of the cases (80.0%) of multiple adenomas were in females and 4 in males (20.0%).

In the great majority of cases the parathyroid adenoma was a single lesion that developed in, and therefore involved, only 1 of the parathyroid glandules. A single adenoma was found 302 times in the total group of 322 cases, a relative incidence of 93.8 per cent.

*Location of the adenoma.* The side of the neck in which the adenoma was found is recorded in 251 cases; in 132 (52.6 per cent) the adenoma occurred on the right side and in 119 (47.4 per cent) it was found on the left side of the neck. In 197 cases the location was further defined to indicate involvement of the superior or the inferior glandule (Table III). In 84 cases (42.7 per cent) the adenoma was located in the region of the right lower parathyroid; in 81 cases (41.1 per cent), in the region of the left lower parathyroid; in 18 cases (9.1 per cent), in the region of the right upper parathyroid; and in 14 cases (7.1 per cent) it was located in the region of the left upper parathyroid.

A single adenoma in an aberrant position was found in 30 (10.7%) of 281 cases. In 19 (63.3 per cent) of these 30 cases the adenoma was located in the mediastinum; in 9 (30.0 per cent), within the substance of the thyroid gland; and in 2 (6.7 per cent), behind the esophagus.

*Weight of the adenoma.* The weight of the single adenoma is recorded in 80 of the total group of 322 cases. These 80 cases are arranged in Table IV. A study of Table IV shows that the weights of the individual tumors varied through an extreme

range. The smallest tumor weighed only 0.4 gm. while the largest attained a weight of 120 gm. The average weight was 12.47 gm. and the mean weight for this series was 7.0 gm.

*Size of the adenoma.* The size of single adenomas is recorded with three dimensional measurements in centimeters for 143 cases. Since the majority of these tumors are roughly ellipsoidal in form, their approximate volume in cubic centimeters can be calculated by the application of the formula we used in computing the size of the parathyroids and the lateral thyroids in human embryos and fetuses (Norris, 1937). The formula is $\frac{\pi}{6}$ a, b, c, in which a, b, and c represent the three diameters; the results from the application of this formula are recorded in Table V.

As may be seen in Table V the estimated volume of the individual tumors in this group of adenomas varied through an extreme range. The volume of the smallest tumor was 0.11 c.c., while that of the largest was 111.3 c.c. The average volume was 9.72 c.c. and the mean volume for this series of 143 adenomas was 3.97 c.c.

*Form and other gross pathological features of the adenoma.* In form, adenomas of the parathyroid are not as variable as they are in size and weight. Generally, they have the form of an ellipsoidal body with three unequal diameters, and in this respect the adenoma resembles a normal parathyroid (Fig. 12). However, in the case of the adenoma there is a tendency for the diameters to approach equality and certain of the tumors have been nearly round. Some adenomas are bilobed and others are angular bodies. Probably the average dimensions of the adenomas thus far described may be stated to be approximately 3.2 x 2.1 x 1.7 cm.

As regards their other gross features parathyroid adenomas are apparently rather similar. They are usually moderately soft, smooth of surface, and encapsulated. Through the capsule they are likely to be grayish brown in color. The cut surface tends to be moist and homogeneous in texture and yellowish- or reddish-brown in color. The depth of the red tone, of course, depends upon the vascularity of the tumor, and at times hemorrhagic areas are present.

*Age incidence.* The age of the patient at the time the adenoma was discovered is stated in 316 of the group of 322 cases. This data is summarized in Table VI.

Parathyroid adenomas have been found in each decade from the second to the eighth, inclusive; no cases have been reported in children under 10 years of age or in adults over 80. Of the patients in the second decade (the youngest age group) 5 were 14 years old, 2 were 16, 4 were 17, 4 were 18, and 3 were 19 years old. The oldest patient was operated on at 77 years of age. The maximum incidence occurred in patients between 40 and 50 years of age, and the incidence in both the fourth and the sixth decades was high and at approximately the same level. Seventy per cent of the adenomas have been found in patients between 30 and 60 years of age. Of the single adenomas the percentage incidence by decades was as follows: second decade, 6.0 per cent; third, 13.5 per cent; fourth, 18.2 per cent; fifth, 29.5 per cent; sixth, 21.6 per cent; seventh, 8.5 per cent; and eighth decade, 2.7 per cent.

*Sex incidence.* Sex is reported in 317 cases of the 322 in this series.

The predominance of females over males is evident in both groups as shown in Table VII, it being in the ratio of approximately 3 to 1 in the group of single adenomas and 4 to 1 in the group of multiple adenomas.

*Incidence of associated osteitis fibrosa generalisata, and renal lithiasis and/or calcification.* Observations were recorded regarding the presence or absence of associated skeletal and renal changes in each of 314 cases included in Table I. The incidence of these associated maladies is summarized in Table VIII. It is striking that only 1.5 per cent of 322 cases failed to show a degree of skeletal or renal change of clinical importance.

## DISCUSSION

*Incidence of the adenoma in groups and according to geography, age and sex.*

As to its general incidence, it may be said that although the parathyroid adenoma is not a common tumor, within the present medical generation the primary hyperparathyroidism with which the lesion is associated has become a well defined clinical entity. Despite this fact the malady continues to be recognized rather late in its course.

This is regrettable for, as with most diseases, the clinical results are better in those cases that come under early management, before deformities and irreparable damage have developed. Probably the general incidence of this tumor is greater than is suspected.

As to its incidence in groups, it is perhaps just as well for the present that we have no figures to indicate the incidence of parathyroid adenomas either in groups of individuals, or in series of surgical cases. This is true because it has been common experience that the incidence of the lesion has risen sharply whenever the threshold of suspicion has been lowered and whenever diagnostic

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1903 | Erdheim | 18 | – | 1 | RL | 2.5 x 1.5 x 1.5 | – | + | | A | |
| 2 | 1904 | Askanazy | 51 | F | 1 | L | 4.5 x 2.0 x 2.0 | – | + | + | A | |
| 3 | 1905 | Hulst | – | F | 1 | RU | 2.5 x 2.5 x 2.0 | – | | | A | In thyroid |
| 4 | 1905 | MacCallum | 26 | M | 1 | RL | 2.0 x 2.0 x 1.7 | – | | + | A | |
| 5 | 1906 | Weichselbaum | – | M | 1 | RL | 2.5 x 1.5 x 1.5 | – | | | A | |
| 6 | 1906 | Weichselbaum | – | F | 1 | LU | 4.3 x 3.6 x 1.0 | – | | | A | |
| 7 | 1907 | Schmorl | 48 | F | 1 | LU | 2.8 x 1.8 x 0.5 | – | + | | A | |
| 8 | 1907 | von Verebly | 42 | F | 1 | RL | 2.5 x 1.8 x 1.5 | – | | | A | 3 other glands normal |
| 9 | 1907 | von Verebly | 56 | M | 1 | LL | 1.2 x 0.8 x 0.3 | – | | | A | |
| 10 | 1913 | Molineus | 74 | F | 1 | R | 2.7 x 1.7 x 0.7 | – | + | | A | |
| 11 | 1913 | Paltauf | 51 | F | 1 | RL | – | – | + | | A | |
| 12 | 1915 | Harbitz | 26 | F | 1 | L | 3.5 x 3.5 x 2.0 | – | + | + | A | |
| 13 | 1916 | Maresch | 65 | F | 1 | RL | 2.7 x 2.3 | – | + | | A | 3 other glands normal |
| 14 | 1916 | Schlagenhaufer | 43 | M | 1 | LL | Plum | – | + | | A | |
| 15 | 1916 | Schlagenhaufer | 62 | F | 1 | RL | Almond | – | + | | A | |
| 16 | 1917 | Meyer | 36 | M | 1 | RL | 4.0 x 3.0 | – | + | | A | 4 other glands normal |
| 17 | 1922 | Fisher and Gunther | 46 | M | 1 | RL | 3.7 x 2.7 x 2.0 | – | + | | A | |
| 18 | 1922 | Hartwich | 60 | F | 1 | L | 7.0 x 2.5 x 1.0 | 4.9 | + | | A | 2 other glands normal |
| 19 | 1922 | Nagelsbach and Westnes | 27 | M | 1 | – | Pigeon's egg | – | + | + | A | |
| 20 | 1922 | Sauer | 21 | M | 1 | LL | Hazelnut | – | + | + | A | |
| 21 | 1922 | Strauch | 27 | F | 1 | L | 4.8 x 3.5 x 3.2 | – | + | | A | |
| 22 | 1923 | Dawson and Struthers | 49 | M | 1 | LL | 2.5 in diameter | – | + | | A | |
| 23 | 1924 | Stenholm | 24 | F | 1 | RL | 1.8 x 1.2 x 1.0 | – | + | + | A | 3 other glands normal |
| 24 | 1924 | Stenholm | 52 | F | 1 | RL | 3.3 x 1.9 x 1.1 | – | + | + | A | |
| 25 | 1925 | Chauveau | 49 | M | 1 | – | 3.0 | – | + | | A | 4 other glands normal |
| 26 | 1925 | Chauveau | 50 | F | 1 | – | Hazelnut | – | + | | A | |
| 27 | 1925 | Mandl | 38 | M | 1 | LL | 2.5 x 1.5 x 1.2 | – | + | | O | |
| 28 | 1926 | Parreira and Castro Freire | 16 | M | 1 | R | Chestnut | – | + | | A | |
| 29 | 1926 | Penecke | 38 | M | 1 | LL | – | 16.0 | + | + | A | |
| 30 | 1926 | Penecke | 59 | F | 1 | RL | – | 5.0 | o | o | A | |
| 31 | 1928 | Gold | 54 | F | 1 | RU | 2.5 x 1.6 | – | + | | O | |
| 32 | 1929 | Barr et al. | 56 | F | 1 | L | 3 in diameter | – | + | + | O | |
| 33 | 1929 | Barr et al. | 38 | M | 1 | – | 5 in diameter | – | + | | O | |
| 34 | 1929 | Boyd et al. | 21 | M | 1 | LL | 3.5 x 2.5 | – | + | | O | 3 other glands normal |
| 35 | 1929 | Eggers | – | F | 1 | LL | Hazelnut | – | + | | O | |
| 36 | 1929 | Hunter | 41 | F | 1 | LL | 3.7 x 3.0 x 3.0 | – | + | | O | |
| 37 | 1929 | Wilder and Wellbrock | 32 | F | 1 | – | 5.0 x 3.5 x 3.0 | – | + | | O | Retrosternal |
| 38 | 1930 | Ask-Upmark | 46 | M | 1 | L | 1.5 x 1.2 x 1.2 | – | + | | A | |
| 39 | 1930 | Compere | 59 | F | 1 | LL | 1.8 x 1.0 | – | + | | O | |

[1] See key to Table in footnote at end of Table.

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 1930 | Drennan | 63 | F | 1 | RL | 4.5 in diameter | – | + | | A | |
| 41 | 1930 | Hecker | – | – | 1 | – | Walnut | – | + | | O | |
| 42 | 1930 | Leri et al. | 31 | M | 1 | RL | – | – | + | + | O | |
| 43 | 1930 | Pemberton | 14 | F | 1 | LL | 1.5 x 1.3 x 1.3 | – | + | | O | |
| 44 | 1930 | Rosenbach and Disque | 24 | F | 1 | RL | – | – | + | | O | |
| 45 | 1930 | Snapper | 56 | M | 1 | LL | 2.5 x 1.4 | – | + | | O | |
| 46 | 1930 | Wanke | 38 | F | 1 | RL | Walnut | – | + | | A | |
| [1]47 | 1930 | Wanke | 41 | F | 2 | RU<br>RL | Coffee bean<br>Almond | – | + | | O | |
| 48 | 1930 | Zajewloschin | 57 | M | 1 | RL | 4.3 x 3.0 x 1.3 | 8.0 | | | A | |
| 49 | 1931 | Allan | 34 | M | 1 | – | – | 10.0 | + | | O | |
| 50 | 1931 | Ask-Upmark | 43 | F | 1 | L | 4.0 x 2.2 x 1.0 | – | + | | O | |
| 51 | 1931 | Berner | 40 | F | 1 | L | 1.8 x 1.8 | 7.0 | + | | A | |
| 52 | 1931 | Berner | 47 | F | 1 | L | Large | – | + | | A | |
| 53 | 1931 | Cooley | 14 | F | 1 | – | – | – | + | | O | |
| 54 | 1931 | Cosin | 17 | M | 1 | RU | 2.7 x 2.2 x 2.0 | – | + | + | O | |
| 55 | 1931 | Dresser and Hampton | 44 | F | 1 | R | 6.5 x 5.0 x 3.0 | 53.0 | + | + | O | |
| [1]56 | 1931 | Hunter and Turnbull | 49 | F | 2 | LU<br>RL | 1.1 in diameter<br>2.8 x 2.5 x 1.8 | – | + | + | A | |
| 57 | 1931 | Hunter and Turnbull | 37 | F | 1 | RU | 2.3 x 1.5 x 0.9 | 1.3 | + | + | O | One other large gland seen |
| 58 | 1931 | Hunter and Turnbull | 49 | F | 1 | LL | 6.8 x 2.8 x 1.4 | 13.5 | + | + | O | |
| [1]59 | 1931 | Hunter and Turnbull | 51 | F | 2 | RU<br>RL | 7.5 x 5.0 x 1.8<br>2.0 x 1.3 x 1.2 | 26.2<br>– | + | + | O | Parts of one mass |
| 60 | 1931 | Lievre and Muller | 41 | F | 1 | RL | 3.5 x 3.0 x 2.0 | – | + | | A | |
| 61 | 1931 | May and Lievre | 45 | M | 1 | LL | 3.0 x 2.0 x 0.8 | 1.8 | + | + | O | |
| 62 | 1931 | Quick and Hunsberger | 25 | M | 1 | LL | 1.7 x 1.5 x 1.1 | – | + | | O | |
| 63 | 1931 | von Redwitz | – | – | 1 | RL | Cherry stone | – | + | | – | |
| 64 | 1931 | Schouten | 55 | M | 1 | – | – | – | + | | – | |
| 65 | 1931 | Schupp | 51 | F | 1 | – | 1.5 x 0.75 x 0.5 | – | + | | A | 3 others normal in thyroid |
| 66 | 1931 | Snapper and Boeve | 35 | F | 1 | L | Almond | – | + | | O | |
| 67 | 1931 | Snapper and Boeve | 57 | M | 1 | LL | 2.5 x 1.5 | – | + | | O | |
| 68 | 1931 | Weil | 44 | F | 1 | RL | 3.1 x 2.2 x 1.6 | – | + | + | O | |
| [1]69 | 1932 | Beyerinck | 35 | F | 2 | R<br>L | – | – | | + | O<br>A | |
| 70 | 1932 | Chievitz and Olsen | 25 | F | 1 | RL | 3.5 x 2.0 x 0.5 | – | + | | O | |
| 71 | 1932 | Frugoni and Alessandri | 18 | F | 1 | R | 2.2 x 1.1 x 0.6 | 0.9 | + | | O | |
| 72 | 1932 | Gaudier and Patoir | 60 | M | 1 | RL | – | – | + | | O | |

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73 | 1932 | Gordon-Taylor and Wiles | 20 | F | 1 | R | 3.5 x 2.5 x 2.5 | – | + | | O | 1 other about normal size |
| [1]74 | 1932 | Hanke | 33 | F | 2 | R<br>L | Walnut<br>Hazelnut | – | + | + | A | |
| [1]75 | 1932 | Hanke | 49 | F | 2 | R<br>L | Hen's egg<br>Walnut | – | + | + | A | 2 others slightly enlarged |
| 76 | 1932 | Hellstrom | 42 | F | 1 | LL | 2.0 x 1.8 x 1.4 | – | + | | O | |
| [1]77 | 1932 | Hellstrom | 42 | F | 2 | R<br>L | Walnut<br>Walnut | – | + | | O | 2 operations 3 months apart |
| 78 | 1932 | Mertz | 70 | F | 1 | RL | 1.0 x 1.0 x 0.5 | – | + | | O | |
| 79 | 1932 | Mertz | 64 | F | 1 | RL | – | – | + | | O | |
| 80 | 1932 | Mertz | 73 | F | 1 | RL | 1.0 x 0.5 x 0.5 | – | + | | O | |
| 81 | 1932 | Morelle | 56 | F | 1 | LL | 6.8 x 6.0 x 2.0 | – | + | + | O | |
| 82 | 1932 | Noble | 40 | M | 1 | LU | 2.0 x 1.8 x 1.5 | – | + | + | A | |
| 83 | 1932 | Renaud et al. | – | – | – | – | 4.0 x 2.5 | – | + | | O | Retrosternal |
| 84 | 1932 | Rosedale | 50 | F | 1 | R | 2.5 x 2.0 | – | + | | O | |
| [1]85 | 1932 | Rusakov and Sakayan | 50 | F | 2 | L<br>R | Cherry stone<br>2.0 x 2.0 x 1.0 | – | + | + | O | |
| 86 | 1932 | Wichmann | 45 | F | 1 | – | 1.3 in diameter | – | + | | O | In thyroid |
| 87 | 1932 | Wilder et al. | 48 | F | 1 | RU | 2.0 x 1.5 x 1.0 | – | + | | O | 3 others slightly enlarged |
| 88 | 1933 | Abel et al. | 58 | F | 1 | LL | 4.0 x 1.8 x 1.6 | 4.3 | + | | O | |
| 89 | 1933 | Cohen and Kelly | 48 | F | 1 | RL | 2.5 x 1.5 x 1.0 | 2.5 | + | + | O | |
| 90 | 1933 | Copello and Barlaro | 46 | M | 1 | LL | – | – | + | + | O | |
| 91 | 1933 | Dyke et al. | 14 | F | 1 | LL | 3.0 x 2.0 x 1.0 | – | + | | O | |
| 92 | 1933 | Dyke et al. | 14 | F | 1 | RL | – | 5.0 | + | | O | |
| 93 | 1933 | Elmslie et al. | 42 | F | 1 | LL | 3.0 x 1.5 x 1.5 | – | + | o | O | |
| 94 | 1933 | Elmslie et al. | 26 | F | 1 | R | 2.5 x 2.0 x 2.0 | – | + | + | O | |
| 95 | 1933 | Elmslie et al. | 23 | F | 1 | L | 3.5 x 1.5 x 0.7 | – | + | + | O | |
| 96 | 1933 | Hand | 39 | M | 1 | LL | 4.0 x 2.5 x 2.0 | – | + | + | A | 2 others normal |
| 97 | 1933 | Keynes and Taylor | 24 | M | 1 | LL | 3.5 x 2.5 | – | + | + | O | |
| 98 | 1933 | Khurgina | 34 | M | 1 | LL | 2.5 x 1.0 | – | + | + | A | |
| 99 | 1933 | Mandl | 47 | F | 1 | – | 4.0 x 2.5 x 2.0 | – | + | | O | Retrosternal |
| 100 | 1933 | Morton | 20 | F | 1 | RL | 2.1 x 1.8 x 0.5 | 1.3 | + | | O | |
| 101 | 1933 | Rankin and Priestly | 34 | F | 1 | R | 6 in diameter | – | + | | O | |
| [1]102 | 1933 | Sainton et al. | 43 | M | 2 | LL<br>LU | Enlarged<br>– | 2.1 | + | | O | |
| 103 | 1933 | Schlesinger and Gold | 42 | F | 1 | – | 5.0 x 4.0 x 4.0 | – | + | | O | In thyroid |
| 104 | 1933 | Schwenson Eiken | 36 | F | 1 | – | 5.0 x 3.5 x 2.0 | 37.0 | + | + | O | |
| 105 | 1933 | Struthers | 47 | M | 1 | LL | 2.5 long | – | + | + | A | |
| 106 | 1933 | Struthers | 38 | F | 1 | R | 1.8 long | – | + | o | O | |
| 107 | 1933 | Struthers | 48 | F | 1 | – | 1.8 long | – | + | + | A | |

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 108 | 1933 | Thomason and Smith | 41 | F | 1 | LU | 2.2 in greatest diameter | – | + | | O | |
| 109 | 1933 | Venables | 52 | F | 1 | R | 1.8 x 1.8 x 1.2 | – | + | | O | In thyroid |
| 110 | 1934 | Barker | 65 | F | 1 | RL | 2.5 x 2.0 x 1.5 | – | + | + | O | |
| 111 | 1934 | Cahill | 22 | F | 1 | RL | Pea-size | – | + | | O | |
| 112 | 1934 | Coryn | 20 | F | 1 | – | Small nut | – | + | | O | |
| 113 | 1934 | Courty and Callens | 60 | F | 1 | RL | Cherry-size | – | + | | O | |
| 114 | 1934 | Gutman et al. | 34 | M | 1 | RL | 2.7 x 1.6 x 1.0 | 3.5 | + | + | O | |
| 115 | 1934 | Gutman et al. | 53 | F | 1 | RL | 3.0 x 2.0 x 0.8 | 4.5 | + | + | O | |
| 116 | 1934 | Gutman et al. | 35 | F | 1 | – | – | – | + | | O | |
| 117 | 1934 | Lewis and Trimble | 65 | F | 1 | RL | 2.5 x 2.1 | – | + | | O | |
| 118 | 1934 | McMahon | 49 | F | 1 | LL | 3.0 x 2.5 | – | + | + | O | |
| 119 | 1934 | Mimpriss and Butler | 17 | M | 1 | – | 1.2 in diameter | – | + | | O | Retrosternal |
| 120 | 1934 | Morelle | 51 | F | 1 | R | 2.2 x 2.0 x 1.7 | – | + | | O | |
| 121 | 1934 | Paterson | 53 | F | 1 | LL | Small olive | – | + | | O | |
| [1]122 | 1934 | Ravina and Lyon | 58 | F | 2 | LU<br>LL | 3–4 times norm.<br>4 greatest diam. | – | + | | O | |
| 123 | 1934 | Sorensen | 74 | M | 1 | LL | 3.5 x 2.5 x 1.5 | 7.0 | + | | O | |
| 124 | 1934 | Strandgaard | 47 | F | 1 | R | 1.7 x 1.0 | 2.0 | + | + | O | |
| 125 | 1934 | Tileston | 48 | F | 1 | RL | Walnut | – | + | + | O | |
| 126 | 1935 | Bellin and Gershwin | 44 | F | 1 | – | 2.2 x 1.2 | – | + | + | O | |
| 127 | 1935 | Brooke | 42 | F | 1 | RL | – | – | + | | O | |
| 128 | 1935 | Brown | 48 | F | 1 | RL | – | – | + | + | O | |
| 129 | 1935 | Cuthbertson and Mackey | 53 | F | 1 | LL | 3.7 x 2.5 x 1.5 | 6.7 | + | | O | |
| 130 | 1935 | Cuthbertson and Mackey | 40 | F | 1 | LL | – | 11.8 | + | | O | Portion of adenoma left *in situ* |
| 131 | 1935 | Cuthbertson and Mackey | 19 | F | 1 | – | – | – | + | | O | |
| 132 | 1935 | Gamberini | 77 | F | 1 | R | 3.5 x 1.5 x 0.9 | – | + | | O | |
| 133 | 1935 | Lahey and Haggert | 62 | F | 1 | LL | 3.7 x 1.9 | – | + | | O | |
| 134 | 1935 | Lahey and Haggert | 53 | F | 1 | RL | Medium sized olive | – | + | | O | |
| 135 | 1935 | Lahey and Haggert | 74 | F | 1 | R | 0.7 x 0.5 | – | + | | O | In thyroid |
| 136 | 1935 | Lahey and Haggert | 44 | F | 1 | RL | 3.8 x 2.0 | – | + | | O | |
| 137 | 1935 | Lahey and Haggert | 52 | F | 1 | RL | 3.0 x 2.0 | – | + | | O | |
| 138 | 1935 | Quick et al. | 28 | M | 1 | – | 3.0 x 2.0 x 1.0 | – | + | | O | |
| 139 | 1935 | Ross | 53 | F | 1 | LL | Large | – | + | + | O | |
| 140 | 1935 | Rutishauser | 63 | M | 1 | R | – | 9.2 | + | | O | |
| 141 | 1935 | Valls et al. | 22 | F | 1 | L | Grain of corn | – | + | | O | |
| 142 | 1935 | Valls et al. | 48 | F | 1 | L | Grain of corn | – | + | | O | |
| 143 | 1935 | Warren and Morgan | 62 | F | 1 | LL | 3.0 x 2.0 x 1.5 | – | + | | O | |
| 144 | 1935 | Warren and Morgan | 52 | F | 1 | RL | 1.0 x 1.0 x 1.0 | – | + | | O | |

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 145 | 1935 | Warren and Morgan | 48 | F | 1 | RU | 0.7 x 0.7 x 0.7 | – | + | | O | In thyroid |
| 146 | 1935 | Warren and Morgan | 52 | F | 1 | RL | 1.5 in great. diam. | – | + | | O | |
| 147 | 1935 | Warren and Morgan | 45 | F | 1 | RL | 3.5 x 2.4 x 1.0 | – | + | | O | |
| 148 | 1935 | Webb | 20 | F | 1 | RL | 4.5 x 2.5 | – | + | | O | |
| 149 | 1936 | Carter, Baker and Howard | 45 | F | 1 | – | Small walnut | – | + | + | O | |
| 150 | 1936 | Castleman, Mallory, Churchill & Cope | 46 | F | 1 | R | 6.5 x 5.0 x 3.5 | 53.2 | + | | O | |
| 151 | 1936 | Castleman, Mallory, Churchill & Cope | 60 | F | 1 | – | 1.0 x 0.5 x 0.4 | – | + | | O | |
| 152 | 1936 | Castleman, Mallory, Churchill & Cope | 41 | F | 1 | – | 3.0 x 1.5 x 0.9 | – | + | + | O | |
| 153 | 1936 | Castleman, Mallory, Churchill & Cope | 55 | F | 1 | LL | 1.5 x 1.0 x 1.0 | – | + | + | O | |
| 154 | 1936 | Castleman, Mallory, Churchill & Cope | 35 | M | 1 | – | 2.5 | – | + | + | O | Mediastinum |
| 155 | 1936 | Castleman, Mallory, Churchill & Cope | 36 | F | 1 | – | 3.0 x 2.5 x 1.0 | – | + | | O | Mediastinum |
| 156 | 1936 | Castleman, Mallory, Churchill & Cope | 44 | F | 1 | R | 2.0 x 0.8 x 0.6 | – | + | + | O | |
| 157 | 1936 | Castleman, Mallory, Churchill & Cope | 33 | M | 1 | LL | 4.0 x 2.2 x 2.0 | 7.0 | + | + | O | |
| 158 | 1936 | Castleman, Mallory, Churchill & Cope | 54 | F | 1 | LL | 3.0 x 1.7 x 0.8 | – | + | + | O | |
| 159 | 1936 | Castleman, Mallory, Churchill & Cope | 53 | F | 1 | LU | 3.0 x 2.0 x 1.0 | 3.85 | + | + | O | |
| 160 | 1936 | Castleman, Mallory, Churchill & Cope | 22 | M | 1 | LU | 1.7 | 2.1 | o | + | O | |
| 161 | 1936 | Castleman, Mallory, Churchill & Cope | 52 | M | 1 | R | 2.2 x 1.8 x 0.9 | 1.2 | + | + | O | |
| [1]162 | 1936 | Castleman, Mallory, Churchill & Cope | 26 | M | 2 | RL | 1.5 x 1.0 x 0.6<br>4.5 x 3.5 x 2.5 | 0.6<br>15.0 | | + | O | Glands very close |
| 163 | 1936 | Castleman, Mallory, Churchill & Cope | 58 | F | 1 | RL | 1.2 x 0.8 x 0.4 | – | + | | O | |
| 164 | 1936 | Castleman, Mallory, Churchill & Cope | 49 | M | 1 | RL | 4.0 x 3.0 x 1.5 | 11.7 | + | | O | |
| [1]165 | 1936 | Castleman, Mallory Churchill & Cope | 30 | F | 2 | RU<br>LU | 1.3 x 0.7 x 0.3<br>1.0 x 0.8 x 0.3 | 0.28<br>0.3 | + | + | O | |
| [1]166 | 1936 | Castleman, Mallory, Churchill & Cope | 35 | F | 2 | RU<br>RL | About same as RL<br>1.0 x 0.6 x 0.3 | – | o | + | O | |
| 167 | 1936 | Castleman, Mallory, Churchill & Cope | 41 | M | 1 | LU | 3.0 x 1.7 x 0.8 | – | + | + | O | 3 other glands seen |
| 168 | 1936 | Elsom, Wood and Ravdin | 35 | F | 1 | LL | 2.0 x 1.0 x 1.0 | – | + | | O | |
| 169 | 1936 | Flick and Gibbon | 66 | M | 1 | R | 4.0 x 2.5 x 2.0 | – | + | | O | |
| 170 | 1936 | Goldman and Smyth | 17 | F | 1 | LL | 3.7 x 3.0 x 2.8 | 11.8 | + | | O | |
| 171 | 1936 | Goldman and Smyth | 23 | M | 1 | LL | 3.0 x 2.0 x 2.0 | 6.5 | + | | O | |
| 172 | 1936 | Hanes | 47 | F | 1 | RU | 2.0 x 1.8 x 1.5 | – | + | + | O | |

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 173 | 1936 | Hanes | 44 | F | 1 | RU | 4.0 x 2.0 x 1.0 | – | + | + | O | |
| 174 | 1936 | Jessop | 53 | F | 1 | – | 4.5 x 3.2 | 19.17 | + | – | O | In superior mediastinum |
| 175 | 1936 | Jessop | 64 | F | 1 | – | 4.3 x 3.0 | 11.4 | + | | O | Behind mediastinal sternum |
| 176 | 1936 | Jessop | 34 | F | 1 | RL | 2.0 x 1.5 x 0.8 | 2.2. | + | | O | |
| 177 | 1936 | McClure | 51 | F | 1 | – | 2 in diameter | – | + | | O | In thyroid |
| 178 | 1936 | Mellgren | 41 | F | 1 | – | 1.7 x 1.5 x 1.1 | – | | | A | Accidental finding at autopsy |
| 179 | 1936 | Möller | 44 | F | 1 | RL | 1.4 x 1.4 x 1.2 | 1.5 | + | + | O | |
| 180 | 1936 | Moore | 34 | M | 1 | LL | 2.5 x 1.75 x 1.0 | – | – | + | O | |
| 181 | 1936 | Neves and Caldas | 53 | M | 1 | RL | 0.9 in diameter | – | + | – | O | |
| 182 | 1936 | Noble and Borg | 33 | F | 1 | L | 4.0 x 2.0 | – | + | | O | |
| [1]183 | 1936 | Payne | 49 | F | 2 | LU<br>RL | Small<br>Larger | – | + | + | A | |
| 184 | 1936 | Riven and Mason | 51 | F | 1 | LL | 2.5 x 1.0 | – | + | + | O | |
| 185 | 1936 | Sisk | 53 | M | 1 | R | 1.5 x 0.75 x 0.5 | – | + | | O | |
| 186 | 1936 | Snell | 47 | M | 1 | RL | 6.0 x 6.0 x 5.0 | 101.0 | + | | O | |
| 187 | 1936 | Wentworth and Lingerman | 33 | F | 1 | R | 3.2 x 1.9 x 1.7 | – | + | | O | |
| 188 | 1937 | Amico | 43 | F | 1 | – | Almond | 13.5 | + | | O | |
| 189 | 1937 | Bauer and Jung | 34 | F | 1 | LU | – | – | + | | O | |
| 190 | 1937 | Bolle | 41 | F | 1 | LL | Walnut | – | + | | O | |
| 191 | 1937 | Brunner | 45 | F | 1 | LL | Almond-size | 0.9 | + | | O | |
| 192 | 1937 | Davidson | 55 | M | 1 | RL | 2.5 in diameter | – | + | + | A | |
| 193 | 1937 | Fahrni | 22 | F | 1 | LL | 2.5 in diameter | 3.88 | + | | O | In mediastinum |
| 194 | 1937 | Fahrni | 17 | F | 1 | LL | 3 in diameter | 13.5 | + | | O | Thyroid tissue attached; weight too great |
| [1]195 | 1937 | Fahrni | 41 | F | 2 | <br>L | 2.4 x 1.8 A<br>2.4 x 2.0 B | – | + | | <br>O | A. In mediastinum<br>B. In thyroid lobe |
| 196 | 1937 | Flick and Gibbon | 60 | M | 1 | RL | 4.0 x 2.5 x 2.0 | – | + | | O | |
| 197 | 1937 | Franck and Hjerrild | 63 | F | 1 | L | 2.0 x 0.8 x 0.6 | – | + | | A | |
| 198 | 1937 | Gomziakov | 26 | F | 1 | LL | 3.5 x 2.3 x 1.0 | – | + | | O | |
| 199 | 1937 | Gordon-Taylor and Handley | 44 | F | 1 | LL | 3.1 x 1.2 x 1.2 | 4.0 | + | | O | Intrathoracic |
| 200 | 1937 | Grasso | 25 | F | 1 | LL | 1.5 x 1.1 x 0.7 | 0.6 | + | | O | |
| 201 | 1937 | Hanes | 49 | F | 1 | LL | – | – | + | + | A | |
| 202 | 1937 | Hirsch | 43 | M | 1 | RL | 6.5 x 4.0 x 2.0 | 24.5 | + | + | O | |
| 203 | 1937 | MacKenzie | 49 | F | 1 | LL | 3.75 x 1.8 | – | + | | O | |
| 204 | 1937 | Meisel | 34 | F | 1 | RU | Pigeon's egg | – | + | | O | |
| 205 | 1937 | Meisel | 32 | M | 1 | LU | Small hen's egg | – | + | | O | |
| 206 | 1937 | Meisel | 42 | M | 1 | RL | Small hazel nut | – | + | | O | |
| 207 | 1937 | Moolten, Clarke and Haywood | 42 | F | 1 | LL | 3.0 x 1.5 x 1.0 | 2.6 | + | | O | Bio-assay of adenoma |
| 208 | 1937 | Petersma | 31 | M | 1 | RL | Chestnut | – | + | | O | |
| 209 | 1937 | Ross | 53 | F | 1 | LL | Large | – | + | + | O | |

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]210 | 1937 | Schrumpf and Harbitz | 58 | M | 2 | RL<br>RL | —<br>— | 20.0<br>1.25 | + | + | O | |
| 211 | 1938 | Allott and Jemson | 19 | F | 1 | L | 3.0 x 2.0 x 1.0 | — | + | | O | Retroesophageal |
| 212 | 1938 | Carnot and Lafitte | 67 | F | 1 | — | — | — | + | + | A | |
| [1]213 | 1938 | Fawcett | 40 | F | 2 | ?<br>LL | Large pea<br>Large pea | — | + | | O | |
| 214 | 1938 | Gutman and Parson | 51 | F | 1 | RL | 4.0 x 2.5 x 1.0 | — | + | + | O | 3 other normal glands seen |
| 215 | 1938 | Gutman and Parson | 54 | F | 1 | LL | 3.0 x 1.5 x 0.5 | — | + | | O | |
| 216 | 1938 | Gutman and Parson | 48 | F | 1 | LU | 2.5 x 1.5 x 1.0 | — | + | | O | |
| 217 | 1938 | Mackenzie | 49 | F | 1 | LL | 3.75 x 1.8 | — | + | | O | |
| 218 | 1938 | McQuillan | 46 | F | 1 | R | 9.0 x 6.0 | — | o | | O | Oxyphil cell adenoma; no clinical findings |
| 219 | 1938 | McQuillan | 53 | F | 1 | R | Golf Ball | — | o | | O | Called carcinoma |
| 220 | 1938 | Mathers and Cappell | 40 | F | 1 | LL | 3.5 x 2.5 x 1.1 | 10.9 | + | | O | |
| 221 | 1938 | Moulanguet and Lièvre | 47 | F | 1 | RU | 4.0 x 3.0 x 2.5 | — | + | | O | |
| 222 | 1938 | Moehren and Eckhert | 38 | M | 1 | L | Olive | — | o | + | O | In adipose tissue between esophagus and trachea |
| 223 | 1938 | Rahm | 58 | M | 1 | LL | 4.5 x 3.0 | 15.0 | + | | O | |
| 224 | 1938 | Sprunt | 54 | F | 1 | — | 2.0 | — | + | o | O | |
| [1]225 | 1938 | Washburn | 44 | M | (3)<br>1 | — | 3.8 x 2.5 x 1.0 | 10.1 | + | + | O | 2 other enlarged glands at autopsy |
| 226 | 1939 | Anderson | 47 | F | 1 | RU | 2.0 x 1.5 x 1.8 | — | + | + | O | |
| 227 | 1939 | Barker and Brines | 18 | F | 1 | R | 2.3 | — | + | | O | |
| 228 | 1939 | Brindle and Herrman | 47 | F | 1 | RL | — | 7.8 | + | + | O | |
| 229 | 1939 | Friderichsen | 23 | F | 1 | — | 3.5 x 2.5 | — | + | + | O | Nursing |
| 230 | 1939 | Giordano | 50 | M | 1 | RL | 3.0 x 2.7 x 1.2 | — | + | | A | |
| 231 | 1939 | Hanes | 49 | F | 1 | LL | — | — | + | + | A | |
| 232 | 1939 | Hughes | 32 | F | 1 | RL | 1.4 | — | + | | O | Spheroidal |
| 233 | 1939 | Johnson | 34 | M | 1 | RL | 2.5 x 1.6 x 1.0 | 3.5 | + | + | O | Autopsy 5 years after parathyroidectomy |
| 234 | 1939 | Mallory | 22 | F | 1 | — | — | — | + | | O | |
| 235 | 1939 | Oliver | 57 | F | 1 | RL | 3.8 x 1.8 | 3.8 | o | + | A | |
| 236 | 1939 | Oliver | 56 | F | 1 | LL | 2.5 x 0.5 | 1.4 | o | + | A | |
| 237 | 1939 | Sharpe | 52 | M | 1 | LU | 7.0 x 6.5 x 4.0 | 120.0 | + | | O | |
| 238 | 1939 | Whyte | 35 | F | 1 | — | 3.5 x 0.5 | 2.0 | + | | O | |
| 239 | 1940 | Arnold | 40 | M | 1 | R | 6.0 x 3.0 x 3.0 | — | + | + | A | Cysts and infarcted areas |
| 240 | 1940 | Baumgartner | 58 | F | 1 | RL | — | 29.0 | + | | O | |
| 241 | 1940 | Brunner | 45 | F | 1 | — | — | 10.9 | + | | O | |
| 242 | 1940 | Fahrni | 37 | F | 1 | RL | 2.0 x 1.0 | — | | + | O | |
| [1]243 | 1940 | Fahrni | 14 | F | 2 | LL | 1.0<br>2.0 | — | + | o | O | Spherical |
| 244 | 1940 | Hart and Gardner | 34 | M | 1 | R | 5.0 x 2.0 x 1.5 | 10.0 | + | | O | |

TABLE I.—ADENOMAS OF THE PARATHYROID: A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Continued

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 245 | 1940 | Hart and Gardner | 53 | F | 1 | LL | 4.0 x 3.0 x 2.0 | – | + | o | O | |
| 246 | 1940 | Hart and Gardner | 49 | F | 1 | RL | 5.0 x 3.5 x 1.5 | 7.0 | + | + | O | |
| 247 | 1940 | Hart and Gardner | 54 | F | 1 | RL | 1.5 x 1.5 x 0.6 | – | + | + | O | |
| 248 | 1940 | Hart and Gardner | 46 | F | 1 | RU | 2.0 x 2.0 x 0.8 | – | o | + | O | |
| 249 | 1940 | Hart and Gardner | 44 | F | 1 | RU | 4.0 x 2.0 x 1.0 | – | o | + | O | |
| 250 | 1940 | Hart and Gardner | 47 | F | 1 | RU | 2.0 x 1.8 x 1.5 | – | + | + | O | |
| 251 | 1940 | Hart and Gardner | 49 | F | 1 | LL | — | – | + | + | A | |
| 252 | 1940 | Hunter | 37 | F | 1 | – | 2.3 x 1.5 x 0.9 | 1.3 | | | | |
| 253 | 1940 | Kleinberg | 49 | M | 1 | LL | – | 13.0 | + | | O | |
| 254 | 1940 | Mozer and Patry | 63 | M | 1 | RU | 3.0 | 9.2 | + | | O | |
| 255 | 1940 | Noad & Miller | 22 | M | 1 | LL | 2.0 x 1.0 x 0.5 | – | + | + | O | |
| 256 | 1940 | O'Connor & Kearns | 43 | F | 1 | LL | 2.0 x 1.3 x 1.0 | – | | + | A | |
| 257 | 1940 | Siris | 32 | F | 1 | RU | 3.2 x 2.9 x 1.8 | 7.0 | + | | O | |
| 258 | 1940 | Smith & Cooke | 44 | F | 1 | RL | 2.5 x 2.0 x 2.0 | 7.0 | + | + | A | |
| 259 | 1940 | Snapper | 37 | M | 1 | L | 2.5 x 2.0 | – | + | | O | |
| 260 | 1940 | Snapper | 44 | F | 1 | RL | Swallow's egg | 2.0 | + | + | O | |
| 261 | 1940 | Vance, Rogde and Breck | 47 | F | 1 | LL | 3.7 x 3.1 x 3.1 | 17.0 | + | | O | |
| 262 | 1941 | Bergstrand | 40 | F | 1 | – | – | – | + | + | O | |
| 263 | 1941 | Bergstrand | 53 | F | 1 | RU | Walnut | – | + | + | A | |
| 264 | 1941 | Chapman | 41 | F | 1 | RL | 3.0 | – | + | | O | |
| 265 | 1941 | Cochrane | 30 | F | 1 | R | Lima bean | – | + | + | O | In thyroid |
| 266 | 1941 | Cochrane | 39 | M | 1 | R | Large Olive | 7.5 | + | | O | |
| 267 | 1941 | Cochrane | 68 | M | 1 | RL | 5.0 x 3.0 x 2.5 | 25.0 | + | | O | |
| 268 | 1941 | Cope | 26 | F | 1 | – | – | – | | + | O | In mediastinum |
| 269 | 1941 | Cope | 54 | F | 1 | LL | 1.8 x 0.8 x 0.5 | 0.4 | + | + | O | In mediastinum |
| 270 | 1941 | Cope | 30 | F | 1 | LL | – | – | + | + | O | In mediastinum |
| 271 | 1941 | Couch & Robertson | 52 | F | 1 | L | 2.75 x 1.5 | – | + | o | O | |
| 272 | 1941 | Couch & Robertson | 64 | F | 1 | RL | 3.0 x 2.0 x 1.5 | – | + | | O | |
| 273 | 1941 | Curtis & Loomis | 29 | M | 1 | L | 4.5 x 2.5 x 2.0 | 11.3 | + | + | O | |
| 274 | 1941 | Denk | 25 | F | 1 | LL | Cherry | – | + | | O | In mediastinum |
| 275 | 1941 | Downs & Scott | 50 | M | 1 | RL | 2.2 x 1.4 | – | + | + | A | |
| 276 | 1941 | Jobe | 19 | F | 1 | L | Damson plum | – | + | | O | |
| 277 | 1941 | Mallory | 33 | F | 1 | – | – | – | + | | O | In mediastinum |
| 278 | 1941 | Threatte et al. | 29 | F | 1 | RL | 2.8 x 2.0 x 1.3 | – | + | | O | |
| 279 | 1941 | Vogt | 76 | M | 1 | – | 5.5 x 5.5 x 4.0 | – | + | | O | |
| 280 | 1942 | Gillette | 34 | F | 1 | – | 4.0 | – | + | | A | |
| 281 | 1942 | Royde | 53 | F | 1 | LL | 5.5 x 2.3 x 1.2 | 11.2 | + | | O | |
| 282 | 1942 | Werner | 62 | F | 1 | RL | 4.2 x 1.9 | – | + | + | A | 2 normal glands found |
| 283 | 1943 | Andre et al. | 35 | F | 1 | LU | Small olive | – | + | + | O | |
| 284 | 1943 | Grollman and Morehead | 25 | F | 1 | RL | 10.0 x 7.0 x 3.0 | – | | + | O | |

TABLE I.—A SUMMARY OF CASE REPORTS FROM THE LITERATURE[1]—Concluded

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 285 | 1943 | Honner et al. | 22 | | 1 | LU | – | – | + | + | O | |
| 286 | 1943 | Mellgren | 51 | F | 1 | RU | 3.0 x 2.1 x 2.0 | – | + | | A | |
| 287 | 1943 | Orr | 35 | F | 1 | L | 3.0 x 2.0 x 1.0 | 4.0 | + | | O | |
| 288 | 1943 | Rice | 45 | F | 1 | RL | 3.5 x 2.0 x 1.5 | – | + | | O | |
| 289 | 1943 | Schrumpf | 60 | M | 1 | LL | 4.5 x 3.0 x 2.5 | – | + | | O | |
| 290 | 1943 | Shofner & Cohn | 47 | F | 1 | – | – | 12.0 | + | + | A | In mediastinum |
| 291 | 1943 | Shofner & Cohn | 34 | F | 1 | – | – | – | + | | O | In mediastinum |
| 292 | 1943 | Shofner & Cohn | 36 | F | 1 | RL | – | – | + | | O | |
| 293 | 1943 | Shofner & Cohn | 51 | F | 1 | LL | – | – | + | | O | |
| 294 | 1943 | Shofner et al. | 29 | F | 1 | LL | 2.0 x 1.4 x 1.0 | 2.2 | + | + | O | |
| 295 | 1944 | Alexander et al. | 21 | M | 1 | RL | – | – | + | + | O | |
| 296 | 1944 | Alexander et al. | 29 | F | 1 | RL | 4.0 x 2.0 x 2.0 | 4.2 | + | + | A | |
| 297 | 1944 | Alexander et al. | 36 | F | 1 | LU | – | – | + | o | O | |
| 298 | 1944 | Alexander et al. | 21 | F | 1 | LL | – | – | + | + | O | |
| 299 | 1944 | Alexander et al. | 27 | F | 1 | – | – | – | + | + | O | |
| 300 | 1944 | Alexander et al. | 31 | M | 1 | – | – | – | + | | O | |
| 301 | 1944 | Alexander et al. | 55 | F | 1 | L | – | – | + | + | O | In mediastinum |
| 302 | 1944 | Coburn | 60 | F | 1 | RL | 3.5 x 2.0 x 1.5 | – | + | + | O | In mediastinum |
| 303 | 1944 | Cope | 68 | M | 1 | RU | 2.2 x 0.6 | 2.4 | + | | A | |
| 304 | 1944 | Cope | 70 | F | 1 | – | 6.0 x 3.0 x 3.0 | – | o | o | O | Pale oxyphil cells almost entirely |
| 305 | 1944 | Foulds | 38 | F | 1 | LL | 1.5 | – | + | + | O | |
| 306 | 1944 | Goldman and Spadin | – | F | 1 | LL | 2.0 | – | o | o | O | Very brief acute course of 3 weeks |
| 307 | 1944 | Nickels | 42 | M | 1 | RL | Hazelnut | – | + | | O | |
| 308 | 1944 | Nickels | 32 | M | 1 | LL | Small hazelnut | – | + | | O | |
| 309 | 1944 | Nickels | 34 | F | 1 | RL | Walnut | – | + | | O | |
| 310 | 1944 | Voltz and Smull | 54 | F | 1 | LL | 2.0 x 1.2 x 0.5 | – | + | | O | |
| 311 | 1945 | Dinsmore and Zidd | 40 | F | 1 | RL | 1.5 | – | + | + | O | |
| 312 | 1945 | Flink | 45 | F | 1 | RL | – | 3.0 | + | | O | |
| 313 | 1945 | Flink | 38 | F | 1 | RU | – | 11.0 | + | + | O | |
| 314 | 1945 | Flink | 57 | F | 1 | – | – | 4.0 | | + | O | |
| [1]315 | 1945 | Flink | 57 | F | 3 | – | – | 3.0<br>18.0<br>2.0 | + | | O | |
| 316 | 1945 | Flink | 40 | F | 1 | – | – | – | + | | O | |
| 317 | 1945 | Flink | 59 | M | 1 | RL | – | 20.0 | + | | O | |
| 318 | 1945 | McClure and Lam | 51 | M | 1 | R | 3.0 x 2.5 x 1.7 | 13.0 | + | + | O | |
| 319 | 1945 | McClure and Lam | 19 | M | 1 | LL | 2.0 x 1.5 x 1.0 | – | | + | O | |
| 320 | 1945 | McClure and Lam | 14 | F | 1 | LL | 2.0 x 1.0 x 1.0 | – | + | | O | |
| 321 | 1945 | McClure and Lam | 18 | F | 1 | R | – | – | + | | O | |
| 322 | 1945 | Windholz | 56 | F | 1 | – | 3.5 x 2.8 x 2.5 | 7.0 | + | + | O | |

[1]Key to abbreviations and signs in Table I: –, indicates no data given, A, autopsy; F, female; M, male; O, operation; RU, right upper parathyroid; RL, right lower parathyroid; LU, left upper parathyroid; LL, left lower parathyroid.

Skeletal changes and renal stones and/or calcification: +, indicates the presence of changes. Blank space, indicates no mention of changes. o indicates author remarked the absence of changes.

APPENDIX TO TABLE I[1]

| Serial No. | Year | Author | Age in Years | Sex | Number of Tumors | Location of Tumors | Measurements of Tumors in Centimeters | Weight of Tumors in Grams | Skeletal Changes | Renal Stones and/or Calcification | Autopsy or Operation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 323 | 1945 | Bickel | 13 | M | 1 | | Small cherry | | | + | O | |
| 324 | 1945 | Hanes | 35 | M | 1 | RL | 2 in diameter | | + | + | O | |
| 325 | 1945 | Poate and Christie | 24 | M | 1 | RL | 3 in diameter | 7.7 | ? | + | O | Bones carefully examined by x-ray showed doubtful slight osteoporosis. |
| 326 | 1946 | Bierman | 44 | F | 1 | LL | | | + | + | O | |
| 327 | 1946 | Mallory | 29 | M | 1 | LU | | | + | + | O | |
| 328 | 1946 | McDonald | 40 | F | 1 | R | 3 in diameter | | + | + | O | In mediastinum. |
| 329 | 1946 | Moehlig et al | 62 | M | 1 | LL | 1.0 x 0.5 x 0.5 | | + | + | O | |
| 330 | 1946 | Norris | 21 | M | 1 | LL | 3.0 x 1.7 x 1.5 | 3.9 | + | | O | |
| 331 | 1946 | Norris | 23 | M | 1 | LL | 2.2 x 1.0 | 1.72 | + | + | O | |
| 332 | 1946 | Norris | 48 | F | 1 | | 2.5 x 2.0 x 0.8 | | | | O | Infarction of adenoma. |
| 333 | 1946 | Norris | 27 | M | 1 | LU | 2.6 x 1.1 x 0.6 | | + | + | O | |
| 334 | 1946 | Norris | 23 | F | 1 | R | 3.5 | | O | | O | Oxyphil adenoma; only symptom was cervical swelling. |
| 335 | 1946 | Rogers | 36 | M | 1 | RL | 3.0 x 1.5 x 1.7 | 4.12 | + | + | A | |
| 336 | 1946 | Vuori | 45 | M | 1 | L | | 6.87 | + | | O | |

[1] Cases of parathyroid adenoma discovered after the statistical analyses of the 322 cases included in Table I had been concluded.

acumen has become more keen. It is probable that figures collected a decade hence may express more accurately the actual incidence of the lesion.

With regard to the incidence at autopsy and at operation, it may be pointed out that during the period of about 20 years after Askanazy described the association of an enlarged parathyroid with skeletal lesions, 26 adenomas were reported as postmortem findings. Following the first surgical removal of an adenoma by Mandl in 1925, the clinical picture of primary hyperparathyroidism became better defined, interest was stimulated, and, so far as the number and source of the reported cases is concerned, the statistical incidence of the tumor was altered greatly (Table II). Thus, in the period of over two decades from 1903 to 1925, 96.3 per cent of the adenomas were autopsy specimens and only 3.7 per cent were removed at operation; whereas in the 10 years from 1926 to 1935 more than 80 per cent of the reported cases came from surgical clinics and less than 20 per cent from the postmortem room; and in the decade from 1936 to 1945, approximately 88 per cent of the reported tumors were operative specimens while only about 12 per cent were discovered at autopsy. These figures become the more significant when account is taken of the fact that during the latter period (1936 to 1945), on the average, 50 per cent more cases were operated on each year than came to surgery during each year of the earlier period. Although the number of cases of parathyroid adenoma reported in the literature probably represents but a fraction of the true incidence, such records as we have suggest that in the future still more cases will be recognized and that a greater number will be given the benefit of earlier surgery.

As to the geographic incidence it may be stated that considerable numbers of cases have been reported from particular clinics, but this must not be taken as evidence to support the contention that the incidence of parathyroid adenomas is influenced by geography (Wilder and Howell, 1936; Cope, 1944). What is true, however, is the indisputable fact that this tumor has been recognized more commonly in those places where men are diagnostically alert to the problems presented by this cryptic malady.

Our information regarding the age incidence of parathyroid adenomas is based upon data that record the age of the patient at the time the tumor was discovered at operation or at autopsy. The scattergram and frequency curves shown in figure 1 emphasize two points. Taking into consideration the entire group of 295 cases, the maximum incidence occurred in patients 45 years of age with a large accumulation on either side of this age, for 70 per cent of the adenomas were found

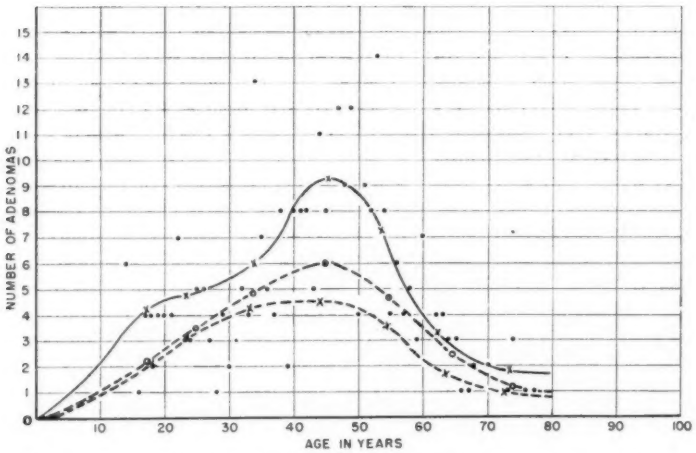



Fig. 1. In this scattergram the number of adenomas found at each year of life have been grouped and plotted as a dot. The frequency curve proper to this scattergram is the upper one drawn in a solid line. Note that this curve has two phases in its ascending limb and that it shows a peak at 45 years. The other two curves, in broken lines, have been taken from Figures 2 and 3, and have been drawn into Figure 1 for readier comparison. (Total of 295 adenomas.)

TABLE II.—ADENOMAS FOUND AT AUTOPSY AND AT OPERATION

| Period of years | Number of years | Total cases | Autopsy | | Operation | |
|---|---|---|---|---|---|---|
| | | | Number of cases | Percentage | Number of cases | Percentage |
| 1903–1925 | 23 | 27 | 26 | 96.3 | 1 | 3.7 |
| 1926–1935 | 10 | 121 | 20 | 16.5 | 101 | 83.5 |
| 1936–1945 | 10 | 174 | 22 | 12.6 | 152 | 87.4 |
| Total | 43 | 322 | 68 | 21.1 | 254 | 78.9 |

in patients between 30 and 60 years of age. Figure 1 also indicates that nearly twice as many cases were discovered in the years of late childhood and early adult life as were observed within the seventh and eight decades.

TABLE III.—LOCATION OF THE ADENOMA

| Location | Number of cases | Percentage |
|---|---|---|
| Right Lower | 84 | 42.7 |
| Left Lower | 81 | 41.1 |
| Right Upper | 18 | 9.1 |
| Left Upper | 14 | 7.1 |
| Total | 197 | 100.0 |
| Right | 132 | 52.6 |
| Left | 119 | 47.4 |
| In aberrant positions | 30 | 10.7 |
| In mediastinum | 19 | 63.3 |
| In the thyroid | 9 | 30.0 |
| Retroesophageal | 2 | 6.7 |
| Position not stated | 41 | 12.7 |
| More than one adenoma | 20 | 6.2 |

We were interested to learn whether the better understanding of hyperparathyroidism that has existed during the last decade would reflect itself in an alteration of the age incidence curve. To this end the 162 cases reported from 1936 to 1945 were studied separately and were plotted in the scattergram marked Figure 2, and a frequency curve was drawn in. Comparison of this curve with the one shown for the entire group in Figure 1 shows that the high peak of middle life has been replaced by a broader curve. Continuing this comparison another difference is apparent: although in the smaller group more cases continue to appear in the early years of life than in the declining decades, there is no longer evidence of an exaggerated concentration of cases in the third decade.

To analyze further the occurrence of this disease in relation to age, the 22 cases discovered at autopsy and reported between 1936 and 1945 were deleted; the 140 remaining cases were plotted in Figure 3. The curve drawn in Figure 3 has no peak; it is characterized by a limb that ascends rather steeply during the early adult years to reach a broad plateau that extends through the middecades, and by a limb of gradual descent after the fiftieth year. The curve of Figure 3 indicates a much more even distribution of the cases through

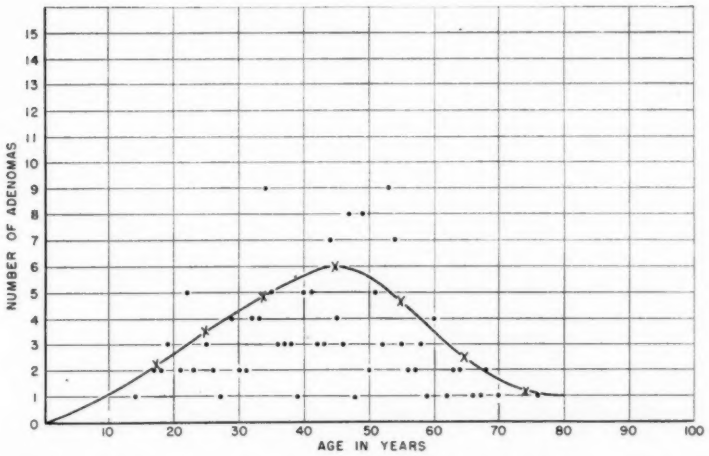



Fig. 2. In this scattergram the number of adenomas found at each year of life have been grouped and plotted as a dot. The frequency curve of this figure also appears as the middle curve in Figure 1. (162 cases reported 1936–1945.)

the life span than appeared in Figures 1 and 2. It seems likely that the curve in Figure 3, based as it is upon corrected data, expresses more accurately the age distribution of parathyroid adenomas than do the curves shown in Figures 1 and 2. For readier comparison the curves from Figures 2 and 3 have been drawn in broken lines in the scattergram marked figure 1.

From the standpoint of the improving standards of clinical medicine, the findings just related are most complimentary. This statistical analysis appears to demonstrate the operation of two most desirable tendencies: (1) that the duration of cases of primary hyperparathyroidism has been reduced, and (2) that during recent years there has been an earlier recognition of cases; both of

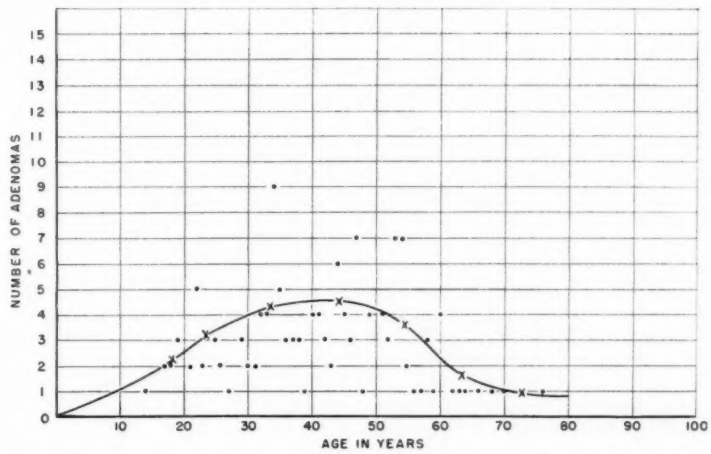



Fig. 3. In this scattergram the number of adenomas found at each year of life have been grouped and plotted as a dot. The frequency curve of this figure also appears as the lowest curve in Figure 1. (140 cases reported 1936–1945; 22 adenomas discovered at autopsy have been deleted.)

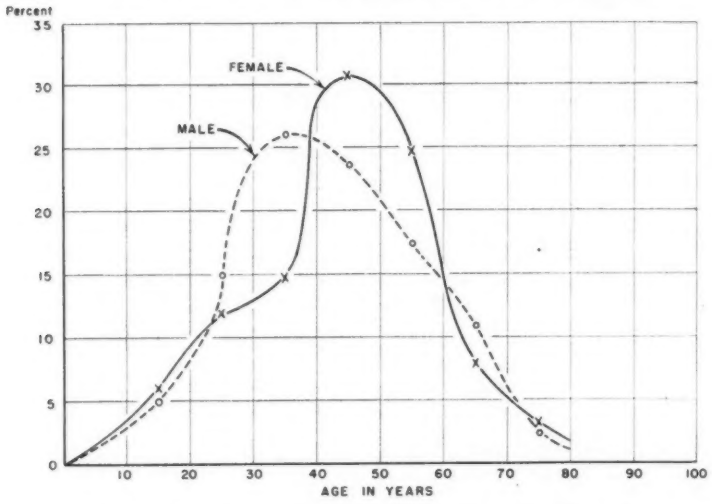



Fig. 4. The curve drawn in a solid line indicates the distribution of adenomas in the group of 217 females; note the presence of two phases in the ascending limb and the location of the peak at 45 years. The curve drawn in a broken line indicates the distribution of adenomas in the group of 80 males; note the relative simplicity of this curve and that its peak is located at about 35 years.

these tendencies appear to be direct results of a better and a more widespread understanding of the disease and its diagnostic criteria.

The sex incidence, as may be seen in Table VII, is such that adenomas of the parathyroid have been found 3 times as frequently in females as in males. For this significant sex difference no satisfactory explanation is found in the literature. In Figure 4, we have approached the problem by the construction of curves showing the percentage distribution in decades of 297 cases according to sex.

In both sexes adenomas begin to be recognized at about the age of puberty. Among males these tumors have been found with constantly increasing frequency through the third decade and this maximum incidence is attained in the fourth decade. Among males, adenomas have been found with constantly diminishing frequency from the fifth decade throughout the remainder of life (Figure 4).

As may be seen in Figure 4, the distribution of the cases among females is somewhat different from that among the males; starting at puberty the curve rises less abruptly for some 20 years and then ascends steeply to a maximum in the fifth decade. Throughout the later decades the incidence in females decreases constantly and precipitously.

From this analysis 4 conclusions seem justified. On the basis of sex there is a difference in the age distribution of parathyroid adenomas. The maximum incidence occurs a decade earlier in males than in females. The maximum incidence among females is greater than that among males. The ascending limb of the curve for females shows two phases; since these two phases extend through and correspond to the childbearing period, it is possible that they may have been influenced or perhaps determined by pregnancy or by lactation.

*Single and multiple adenomas.* In the answer to the query whether true adenomas of the parathyroid are ever multiple, will be found much of fundamental and practical importance. Only 20 cases have been reported as examples of the parathyroid adenoma in which a tumor was found in more than one glandule. These cases are too few to have great statistical significance as a group. However, since their distribution according to age and according to sex is much the same as obtains for the group of single adenomas, the fact that we have chosen to omit them from combined consideration with the much larger group of single tumors has not appreciably altered the conclusions reached. Indeed, if any observation argues strongly that the group of multiple tumors are true adenomas, it certainly is the fact that age and sex distribution of the two groups is so similar.

It is well known that certain conditions, such as severe chronic renal insufficiency, are often associated with hypertrophy of all of the parathyroids. In such instances the parathyroid tumefaction is due to a parenchymal hyperplasia that is secondary to the underlying disease. This is therefore a secondary hyperplasia of the glandules and a condition that must be carefully distinguished from the primary hyperplasia (neoplasia) of the true adenoma. This thesis was established largely by the excellent studies of Albright and his coworkers and their published work did not appear until 1938. It so happens that of the 20 cases of multiple adenomas, only 2 have been reported since 1938!

If we study the basic data recorded for these 20 cases more carefully several points become evident. One case (Table I, Serial No. 75) had 4 enlarged glands; 2 that were very large and 2 that were said to be enlarged but the size was not given. In another case (Table I, Serial No. 225) 3 enlarged glands were reported; 1, which was definitely enlarged, was removed at operation, and the 2 other enlarged glands, the measurements of which were not given, were found at autopsy. Three large glands were also found in the case recorded in Table I as Serial No. 315; these were later interpreted as representing "primary hyperplasia of the 'wasserhelle' cells." In 3 of the remaining 17 cases (Table I, Serial Nos. 69, 102, 210) no absolute measurements of the glands are recorded, and in another 3 (Table I, Serial Nos. 165, 166, 243) the size of the second gland was such that it could fall within normal limits. In 2 cases (Table I, Serial Nos. 59, 162) the tumors may have been more or less separate parts of one mass. There remain 9 cases (Table I, Serial Nos. 47, 56, 74, 77, 85, 122, 183, 195, 213) for each of which the data recorded are too incomplete to permit utilization of the cases as a group for deciding an issue such as that involved in the present problem.

Finally, it needs to be pointed out that among this entire group of 20 cases, there were 12 in which advanced renal disease was recognized. Since secondary hyperplasia of the parathyroids is not infrequently associated with high degrees of chronic renal insufficiency, the burden of proof must rest with each investigator to demonstrate the absence of renal or other previous disease, in all of those cases of multiple enlargements of the parathyroid glands that are thought to be adenomas.

Only one conclusion seems justifiable: although it is possible that more than 1 adenoma may develop in 2 or more glands in the same case at the same time, up to the present time the literature has contained few convincing reports of multiple adenomas of the parathyroids that may be accepted without question.

TABLE IV.—INDIVIDUAL WEIGHTS OF 80 ADENOMAS

| Number | Serial No. from Table I | Weight in grams | Number | Serial No. from Table I | Weight in grams | Number | Serial No. from Table I | Weight in grams |
|---|---|---|---|---|---|---|---|---|
| 1 | 269 | 0.4 | 28 | 287 | 4.0 | 55 | 281 | 11.2 |
| 2 | 200 | 0.6 | 29 | 314 | 4.0 | 56 | 273 | 11.3 |
| 3 | 71 | 0.9 | 30 | 296 | 4.2 | 57 | 175 | 11.4 |
| 4 | 191 | 0.9 | 31 | 88 | 4.3 | 58 | 164 | 11.7 |
| 5 | 161 | 1.2 | 32 | 115 | 4.5 | 59 | 130 | 11.8 |
| 6 | 57 | 1.3 | 33 | 18 | 4.9 | 60 | 170 | 11.8 |
| 7 | 100 | 1.3 | 34 | 30 | 5.0 | 61 | 290 | 12.0 |
| 8 | 252 | 1.3 | 35 | 92 | 5.0 | 62 | 253 | 13.0 |
| 9 | 236 | 1.4 | 36 | 171 | 6.5 | 63 | 318 | 13.0 |
| 10 | 179 | 1.5 | 37 | 129 | 6.7 | 64 | 58 | 13.5 |
| 11 | 61 | 1.8 | 38 | 51 | 7.0 | 65 | 188 | 13.5 |
| 12 | 124 | 2.0 | 39 | 123 | 7.0 | 66 | 194 | 13.5 |
| 13 | 238 | 2.0 | 40 | 157 | 7.0 | 67 | 223 | 15.0 |
| 14 | 260 | 2.0 | 41 | 246 | 7.0 | 68 | 29 | 16.0 |
| 15 | 160 | 2.1 | 42 | 257 | 7.0 | 69 | 261 | 17.0 |
| 16 | 176 | 2.2 | 43 | 258 | 7.0 | 70 | 174 | 19.17 |
| 17 | 294 | 2.2 | 44 | 322 | 7.0 | 71 | 317 | 20.0 |
| 18 | 303 | 2.4 | 45 | 266 | 7.5 | 72 | 202 | 24.5 |
| 19 | 89 | 2.5 | 46 | 228 | 7.8 | 73 | 267 | 25.0 |
| 20 | 207 | 2.6 | 47 | 48 | 8.0 | 74 | 59 | 26.2 |
| 21 | 312 | 3.0 | 48 | 140 | 9.2 | 75 | 240 | 29.0 |
| 22 | 114 | 3.5 | 49 | 254 | 9.2 | 76 | 104 | 37.0 |
| 23 | 233 | 3.5 | 50 | 49 | 10.0 | 77 | 55 | 53.0 |
| 24 | 235 | 3.8 | 51 | 244 | 10.0 | 78 | 150 | 53.2 |
| 25 | 159 | 3.85 | 52 | 220 | 10.9 | 79 | 186 | 101.0 |
| 26 | 193 | 3.88 | 53 | 241 | 10.9 | 80 | 237 | 120.0 |
| 27 | 199 | 4.0 | 54 | 313 | 11.0 | | | |

*Location of the adenoma.* In 1937 we published the results of an investigation of the topographic anatomy of the parathyroid glands in 93 human embryos and fetuses. The range of variability in the position of the glandules was established, and the reasons for the topographic variations were elucidated (Norris, 1937). For the surgeon an exact knowledge of the embryogenesis of these glandules is important in order that he may understand the locations in which tumors of the parathyroids are to be sought. Because of their significance in this connection certain of the illustrations from our earlier study (Norris, 1937) have

TABLE V.—ESTIMATED VOLUME IN CUBIC CENTIMETERS OF 143 ADENOMAS

| Number | Serial No. from Table I | Estimated Volume in c.c. | Weight in Grams | Number | Serial No. from Table I | Estimated Volume in c.c. | Weight in Grams | Number | Serial No. from Table I | Estimated Volume in c.c. | Weight in Grams |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 151 | 0.11 | | 49 | 27 | 2.38 | | 97 | 318 | 6.67 | |
| 2 | 80 | 0.13 | | 50 | 207 | 2.39 | 2.6 | 98 | 245 | 6.74 | |
| 3 | 9 | 0.15 | | 51 | 61 | 2.54 | 1.8 | 99 | 123 | 6.95 | 7.0 |
| 4 | 145 | 0.18 | | 52 | 115 | 2.54 | 4.5 | 100 | 129 | 7.35 | 6.7 |
| 5 | 163 | 0.20 | | 53 | 76 | 2.67 | | 101 | 244 | 7.95 | 10.0 |
| 6 | 78 | 0.27 | | 54 | 82 | 2.86 | | 102 | 6 | 8.20 | |
| 7 | 269 | 0.28 | 0.4 | 55 | 172 | 2.86 | | 103 | 294 | 8.48 | |
| 8 | 185 | 0.29 | | 56 | 226 | 2.86 | | 104 | 257 | 8.85 | 7.0 |
| 9 | 65 | 0.30 | | 57 | 250 | 2.86 | | 105 | 48 | 8.89 | 8.0 |
| 10 | 156 | 0.50 | | 58 | 1 | 2.98 | | 106 | 18 | 9.27 | 4.9 |
| 11 | 197 | 0.50 | | 59 | 5 | 2.98 | | 107 | 157 | 9.33 | 7.0 |
| 12 | 103 | 0.53 | | 60 | 91 | 3.18 | | 108 | 2 | 9.54 | |
| 13 | 200 | 0.61 | 0.6 | 61 | 159 | 3.18 | 3.85 | 109 | 164 | 9.54 | 11.7 |
| 14 | 310 | 0.62 | | 62 | 211 | 3.18 | | 110 | 17 | 10.59 | |
| 15 | 247 | 0.71 | | 63 | 286 | 3.18 | | 111 | 96 | 10.60 | |
| 16 | 71 | 0.77 | 0.9 | 64 | 10 | 3.21 | | 112 | 99 | 10.60 | |
| 17 | 192 | 0.78 | | 65 | 8 | 3.57 | | 113 | 169 | 10.60 | |
| 18 | 153 | 0.79 | | 66 | 93 | 3.58 | | 114 | 196 | 10.60 | |
| 19 | 100 | 1.00 | 1.3 | 67 | 4 | 3.60 | | 115 | 60 | 11.13 | |
| 20 | 320 | 1.04 | | 68 | 24 | 3.65 | | 116 | 73 | 11.59 | |
| 21 | 168 | 1.06 | | 69 | 278 | 3.85 | | 117 | 273 | 11.92 | 11.3 |
| 22 | 23 | 1.14 | | 70 | 155 | 3.94 | | 118 | 12 | 12.98 | |
| 23 | 38 | 1.14 | | 71 | 120 | 3.96 | | 119 | 304 | 12.98 | |
| 24 | 215 | 1.19 | | 72 | 110 | 3.97 | | 120 | 281 | 13.34 | |
| 25 | 179 | 1.24 | 1.5 | 73 | 173 | 4.24 | | 121 | 246 | 13.91 | 7.0 |
| 26 | 176 | 1.27 | 2.2 | 74 | 249 | 4.24 | | 122 | 58 | 14.13 | 13.5 |
| 27 | 7 | 1.34 | | 75 | 198 | 4.26 | | 123 | 221 | 15.90 | |
| 28 | 43 | 1.34 | | 76 | 147 | 4.45 | | 124 | 170 | 16.47 | 11.8 |
| 29 | 257 | 1.37 | | 77 | 199 | 4.46 | 4.0 | 125 | 104 | 17.55 | 37.0 |
| 30 | 62 | 1.48 | | 78 | 50 | 4.66 | | 126 | 36 | 17.65 | |
| 31 | 178 | 1.48 | | 79 | 132 | 4.72 | | 127 | 289 | 17.66 | |
| 32 | 310 | 1.57 | | 80 | 122 | 4.77 | | 128 | 261 | 18.84 | 17.0 |
| 33 | 87 | 1.59 | | 81 | 143 | 4.77 | | 129 | 267 | 19.87 | 25.0 |
| 34 | 252 | 1.64 | 1.3 | 82 | 220 | 5.10 | 10.9 | 130 | 202 | 27.56 | 24.5 |
| 35 | 57 | 1.65 | 1.3 | 83 | 230 | 5.15 | | 131 | 37 | 27.82 | |
| 36 | 248 | 1.69 | | 84 | 94 | 5.30 | | 132 | 304 | 28.27 | |
| 37 | 70 | 1.85 | | 85 | 214 | 5.30 | | 133 | 21 | 28.49 | |
| 38 | 101 | 1.89 | 1.2 | 86 | 255 | 5.30 | | 134 | 239 | 28.62 | |
| 39 | 95 | 1.95 | | 87 | 258 | 5.30 | 7.0 | 135 | 59 | 37.42 | 26.2 |
| 40 | 216 | 1.98 | | 88 | 187 | 5.47 | | 136 | 103 | 42.40 | |
| 41 | 89 | 1.99 | 2.5 | 89 | 287 | 5.56 | 4.0 | 137 | 81 | 43.25 | |
| 42 | 109 | 2.06 | | 90 | 300 | 5.57 | | 138 | 55 | 51.68 | 53.0 |
| 43 | 233 | 2.12 | 3.5 | 91 | 68 | 5.78 | | 139 | 150 | 60.28 | 53.2 |
| 44 | 152 | 2.15 | | 92 | 88 | 6.10 | 4.3 | 140 | 279 | 64.13 | |
| 45 | 158 | 2.16 | | 93 | 54 | 6.29 | | 141 | 186 | 95.40 | 101.0 |
| 46 | 167 | 2.16 | | 94 | 171 | 6.36 | 6.5 | 142 | 237 | 96.46 | 120.0 |
| 47 | 114 | 2.29 | 3.5 | 95 | 286 | 6.59 | 13.0 | 143 | 284 | 111.30 | |
| 48 | 180 | 2.31 | | 96 | 3 | 6.62 | | | | | |

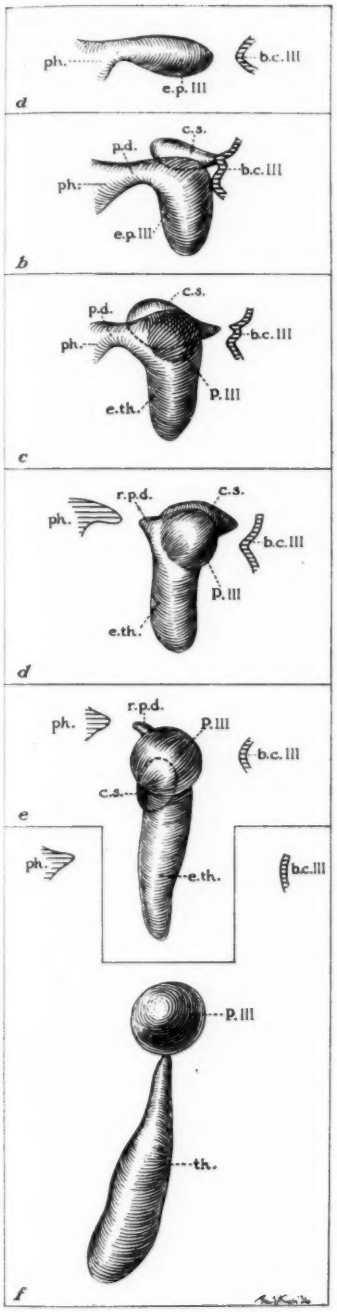
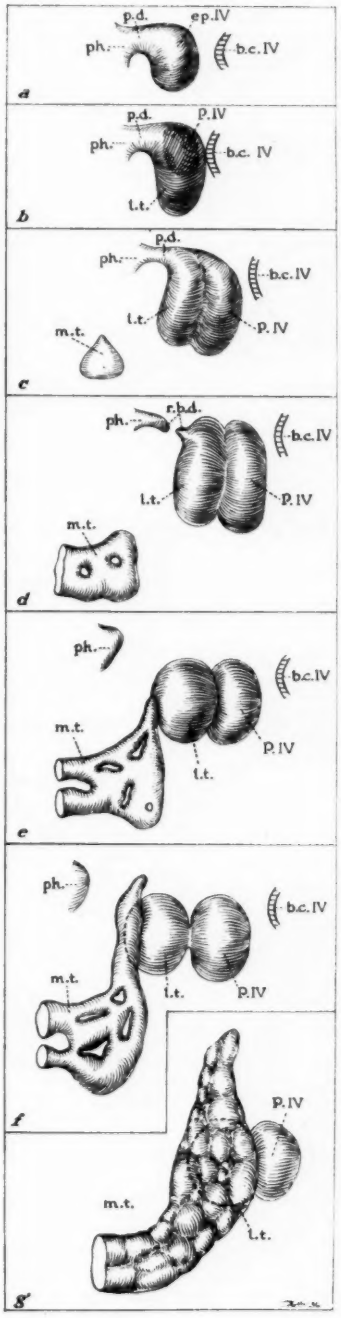



Fig. 5. Left, A schematic interpretation of the morphogenesis of the third branchial pouch and its derivatives. For detailed description of units see text of article by Norris, 1937: a and b, preprimordial stage; c, early primordial stage; d, early branchial complex stage; e, late branchial complex stage; f, late branchial complex stage, (definitive form stage not included); b.c.III, third branchial cleft (ectoderm); c.s., cervical sinus (ectoderm); e.th., entodermal thymus; e.p.III, third entodermal branchial pouch; p.III, parathyroid III; p.d., pharyngobranchial duct; ph., pharynx; r.p.d., remnant of pharyngobranchial duct; th., thymus.

Fig. 6. Right, A schematic interpretation of the morphogenesis of the fourth branchial pouch and its derivatives. The median thyroid has also been included. For detailed description of units see text of article by Norris, 1937: a, Preprimordial stage; b and c, early primordial stage; d, branchial complex stage; e, fusion stage; f, isolation stage (definitive form stage not included). In the diagram the stages represented are named by a combination of the terms applied in the study of the lateral thyroid and parathyroid: IV. b.c., fourth branchial cleft (ectoderm); e.p.IV, fourth entodermal branchial pouch; l.t., lateral thyroid; m.t., median thyroid; p.IV, parathyroid IV; p.d., pharyngobranchial duct; ph., pharynx; r.p.d., remnant of pharyngobranchial duct.



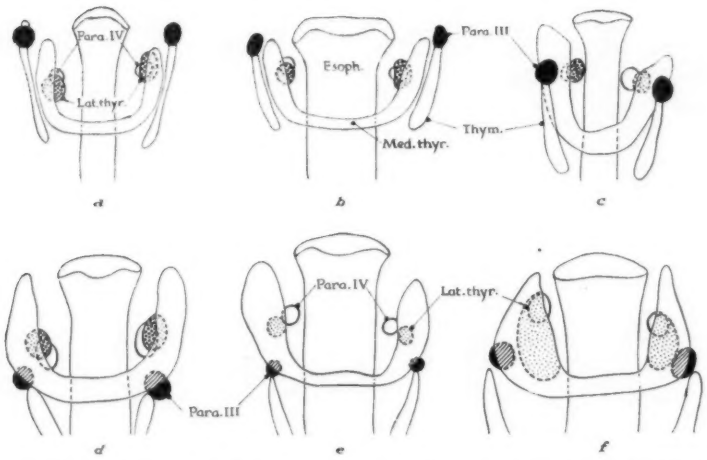



Fig. 7. An arrangement of drawings based upon selected graphic reconstructions to show the usual changing relations of the derivatives of the third and fourth branchial pouches during the branchial complex stage. All of the drawings represent anterior views. The central structure in outline represents the esophagus; the U-shaped figure in outline, the median thyroid; the elongated barlike bodies in outline, the thymus. Parathyroid III is shown in solid black (diagonals where it lies behind the thyroid); parathyroid IV, in simple outline; lateral thyroid, in coarse stipple (finer stipple when it lies behind or within the median thyroid lobe). (a) Graphic reconstruction of pharyngeal region of 15.0 mm. embryo. (x30.) (b) Graphic reconstruction of pharyngeal region of 16.0 mm. embryo. (x30.) (c) Graphic reconstruction of pharyngeal region of 17.0 mm. embryo. (x30.) Note that parathyroid III has descended so that it lies in approximately the same plane a parathyroid IV. (x30.) (d) Graphic reconstruction of pharyngeal region of 16.0 mm. embryo. Parathyroid III has descended to the level of its usual definitive position. (x30.) (e) Graphic reconstruction of pharyngeal region of 20.0 mm. embryo. This figure represents the end of the branchial complex stage and shows the parathyroids nearly isolated and in their usual definitive positions. (x30.) (f) Graphic reconstruction of pharyngeal region of 24.0 mm. embryo. This figure shows the very striking growth that has taken place in the lateral thyroids and the resultant altered form of the lateral lobes of the thyroid gland. Compare the outline form of the median thyroid in this figure with the outline form of the same body in a, b, c, d, e. (×30.)

been reproduced in this article (Figures 5, 6, 7, 8, 9, 10, 11). These figures are described and explained in the individual legends. A surgeon should not consider himself competent to operate for a parathyroid adenoma unless he has a thorough knowledge of the embryology of the human pharynx and its derivatives. To determine the site of the tumor is the first problem of the surgeon as he enters the neck to treat hyperparathyroidism; and, almost entirely, the various possible sites in which the tumor may be situated are determined by the mechanics of genetics in the cervical region of the individual.

Adenomas of the parathyroid glands are about equally frequent on the right and on the left side of the neck (Table III). In the series of 251 cases, 52.6 per cent (132) of the adenomas were found on the right side, and 47.4 per cent (119) were discovered on the left side of the neck. However, when the frequency of adenomatous involvement of the superior and inferior glandules is considered, a remarkable difference becomes apparent (Table III).

In the group of 197 cases, 83.8 per cent (165) of the adenomas were found in the region of the inferior glandule, while only 16.2 per cent (32) were located in the region of the superior glandule. Here again the distribution of the cases in which the adenoma was found in the inferior and superior positions is about equal when they are divided into right and left groups. Thus 42.7 per cent (84) of the adenomas were located in the right inferior position and 41.1 per cent (81) were found in the left lower position; 9.1 per cent (18) were located in the right superior position, and 7.1 per cent (14) were found in the left superior position.

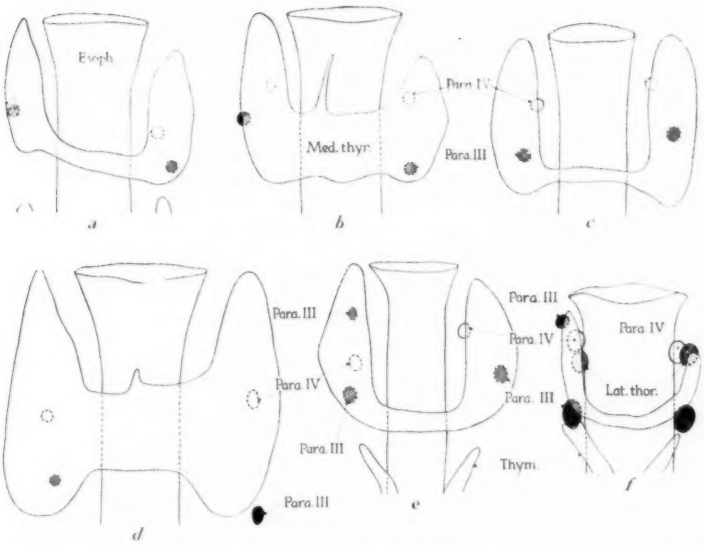



Fig. 8. An arrangement of drawings based upon selected graphic reconstructions to show variations in the more usual definitive relations of the parathyroids and certain anomalies. All drawings represent anterior views. The central structure in outline represents the esophagus; the bilobed body in outline, the definitive thyroid; the barlike bodies in outline, the thymus. Parathyroid III is shown in solid black (diagonals where it lies behind the thyroid); parathyroid IV, in simple outline (broken line where it lies behind the thyroid); lateral thyroid, in coarse stipple (finer stipple when it lies behind the median thyroid lobe). (a) Graphic reconstruction from cervical region of 60.0 mm. fetus. (×10.) (b) Graphic reconstruction from cervical region of 66.0 mm. fetus. (×10.) (c) Graphic reconstruction from cervical region of 83.0 mm. fetus. (×10.) (d) Graphic reconstruction from cervical region of 83.0 mm. fetus. (×10.) (e) Graphic reconstruction from cervical region of 65.0 mm. fetus. Note presence and location of accessory parathyroid III. (×10.) (f) Graphic reconstruction from pharyngeal region of 22.0 mm. embryo. Note presence and location of accessory parathyroid III. In this figure the lateral thyroid has fused with, but has not been incorporated by, the median thyroid. (×30.)

In view of the extent of the migration of the inferior parathyroid that goes on normally during embryogenesis, it is not surprising that adenomas are found in aberrant positions (Figs. 5, 6, 7, 8, 9). In the series of 281 cases the tumor was found in an abnormal situation in 30 cases (10.7 per cent). In this group of 30 cases the tumor was found in the mediastinum in 63.3 per cent, imbedded in the thyroid in 30.0 per cent, and behind the esophagus in 6.7 per cent of the instances. The adenomas discovered in the mediastinum are there because the glandule from which the tumor arose was drawn down into the thorax by the descending thymus.

The tumors which were imbedded in the normal thyroid grew in parathyroids that had been surrounded by the expanding thyroid during fetal life (Figs. 10 and 11).

These observations have practical value for the operating surgeon. Since the average size of a parathyroid adenoma is small, and since the extensive dissection in search of the tumor demands the utmost care, a scientific plan should guide the cervical exploration. On the basis of the frequency with which adenomas have been found in certain locations a formula to guide the surgeon's approach may be suggested. First the region of the right lower thyroid pole should be explored, then that of the left lower thyroid pole, then the region of the right superior glandule, and, finally, the usual location of the left superior parathyroid should be exposed. In seeking an adenoma in the region of the superior glandule it must be remembered that superior, in this instance, does not necessarily correspond to the upper pole of the thyroid gland, but more nearly to the midlevel of

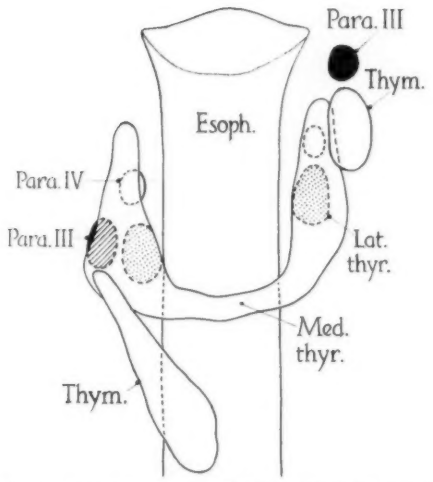



Fig. 9. Drawing of a graphic reconstruction from the pharyngeal region of 24.2 mm. embryo. Anterior view. Note the anomalous undescended third branchial complex on the left side which contrasts strikingly with the normal condition on the right side. Note swellings in median thyroid lobes at places where lateral thyroid bodies have been incorporated. The central structure in outline represents the esophagus; the U-shaped body in outline, the median thyroid; the barlike and ovoidal bodies in outline, the right and left thymus, respectively. Parathyroid III is shown in solid black (diagonals where it lies behind the thyroid); parathyroid IV, in simple outline (broken line where it lies behind the thyroid); lateral thyroid in fine stipple for it has been incorporated within the median thyroid. (×20.)

the lateral thyroid lobe. As the dissection progresses in each of these fields the contours of the thyroid had best be carefully scrutinized in order that a tumor imbedded in the substance of the thyroid may not be overlooked. Finally, in the cervical exploration, the tracheoesophageal angle, the retroesophageal space, and the carotid sheath on each side remain for inspection. Ultimately, when the cervical exploration has been fruitless, the surgeon must open the mediastinum. Excellent descriptions of the technique of parathyroid surgery are found in articles by Churchill and Cope (1934 and 1936), and by Cope (1941).

*Weight, size, form, and other gross pathological features of the adenoma.* The site of the tumor is the first problem, and the size of the adenoma becomes the second problem of the operating surgeon. Most adenomas of the parathyroid are relatively small, soft, encapsulated tumors; they are too small, in the majority of cases, to produce local symptoms that the patient will recognize, or signs that the physician may discern in his physical examination of the neck. However, it may be well to call attention to the fact that in a few cases the patient may complain of a swelling in the neck, dysphagia, or the like.

Previously we have pointed out the wide variability in the size of these lesions. The smallest adenomas have been very tiny bodies while the largest have attained truly exceptional proportions. Indeed, as may be seen in Tables IV and V, the 10 largest tumors in our series were of sufficient size to account for a wide disparity between the average and the mean values of weight and volume. Of course, the larger tumors will cause the surgeon no difficulty in his exploration. Therefore, from the practical point of view and in dealing with the majority of cases, it will be best for the surgeon to have in mind the mean values. For the most part he will be searching for a tumor whose weight will approach 7.0 gm., whose volume will approximate 4 or 5 c.c., and whose diameters may be expected to vary from a mean of about 3.2 by 2.1 by 1.7 cm.

Pains were taken to estimate the volume of the 143 adenomas for each of which 3 diametric measurements were given. This was done because suitable data for this calculation were available for nearly twice as many tumors as were included in the group that had been weighed. Forty-four tumors had been both weighed and measured and it was interesting to note the close degree of correspondence between the weight and the estimated volume in the majority of these cases (Table V). In only 6 cases (13.6 per cent) was the discrepancy between the recorded weight and the estimated volume too great to be readily accounted for.

In our series the smallest adenoma weighed 0.4 gm., while the largest weighed 120.0 gm., and the mean weight was 7.0 gm. The biological and clinical significance of these figures may be seen in Table IV.

If a normal parathyroid gland weighs approximately 0.035 gm., then under normal conditions

TABLE VI.—DISTRIBUTION OF ADENOMAS BY DECADE

| Age in Years | 0–9 | 10–19 | 20–29 | 30–39 | 40–49 | 50–59 | 60–69 | 70–79 | 80–89 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|
| Number of Single Adenomas | 0 | 18 | 40 | 53 | 86 | 65 | 25 | 8 | 0 | 295 |
| Number of Multiple Adenomas | 0 | 1 | 1 | 4 | 9 | 5 | 0 | 0 | 0 | 20 |

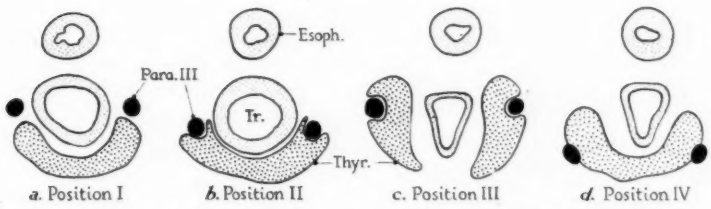



Fig. 10. Group of diagrams representing cross sections through thyroid region to indicate variations in position of parathyroid III. These four diagrams correspond to the four position groups described in the article by Norris, 1937. Parathyroid III is shown in solid black; definitive thyroid in coarse stipple; esophagus trachea (or larynx) in fine stipple.

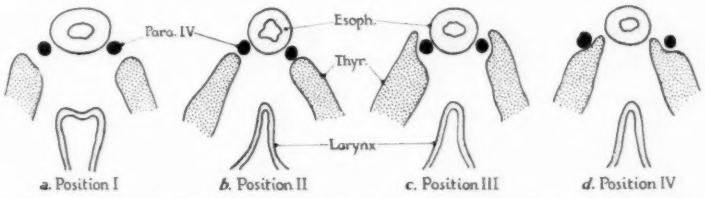



Fig. 11. Group of diagrams representing cross sections through thyroid region to indicate variations in position of parathyroid IV. These four diagrams correspond to the four position groups described in the article by Norris, 1937. Parathyroid IV is shown in solid black; definitive thyroid, in coarse stipple; esophagus and larynx, in fine stipple.

the combined weight of all the parathyroid tissue would be about 0.14 gm. Thus, the smallest adenoma, of 0.4 gm., was more than 10 times as large as a normal glandule and approximately 3 times the mass represented by the total parathyroid tissue of the body. This small tumor was associated with a striking clinical picture in which both skeletal and renal changes were prominent.

The largest tumor, with its weight of 120.0 gm., was nearly 3,500 times as large as a normal glandule and approximately 850 times greater than the mass of all the parathyroid tissue of the body. Adenomas of 7.0 gm., representing the mean weight of the tumors in our series, show an hypertrophy of nearly 200 times, and 50 times, respectively, the size of a normal glandule and the total parathyroid tissue of the body.

As Castleman and Mallory (1935) pointed out: "If this new formed glandular tissue functioned in proportion to its size, some individuals would die of parathyroid poisoning, like that so easily produced in animals with parathormone, unless some compensating mechanism were brought into play." Using the blood calcium levels these same authors thought they could demonstrate "a roughly quantitative relation between the size of tumor and degree of hyperfunction." However, they stated that "as the size of the tumor increases the proportional effect of unit weight on the blood calcium becomes rapidly less and less."

In Figure 12 the characteristic form of an adenoma is shown in comparison to the size and form of a normal parathyroid glandule. Although the adenoma shown in this illustration may be considered typical, not a few adenomas have been much more irregular in form. Some have been irregularly bilobed, or nearly separated into two distinct masses; it is certain of such cases that may have been misinterpreted as examples of multiple adenomas. From the practical point of view, however, the knowledge that lobulated tumors exist, should cause the surgeon to search carefully in the vicinity from which an adenoma has been removed: if a partially detached lobule or a portion of such a tumor is not removed the clinical result would be spoiled, or possibly a second operation would be necessary.

Through the capsule the tumor has a grayish brown color. On the cut surface tones of yellowish brown are mixed with shades of red that depend upon the richness of the vascularity. Most adenomas are soft and have a texture similar to that of the normal spleen. However, in some the presence of sufficient stromal tissue in the form of septal bands may considerably increase the consistency. Deposits of calcium in the capsule or in

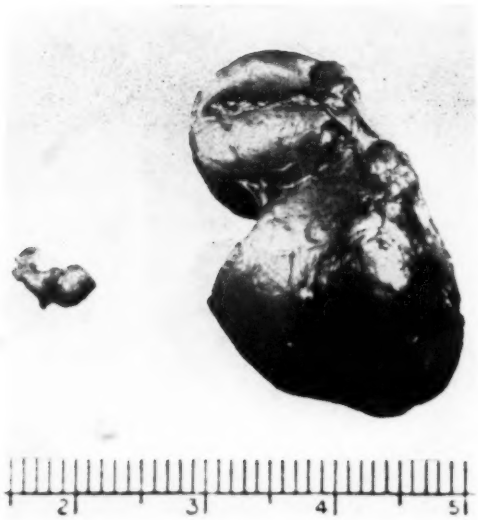


Fig. 12. Photograph of the parathyroid adenoma removed from a patient suffering from generalized osteitis fibrosa. The adenoma weighed 3.9 gm. Note the bilobed form of the adenoma. The small object at the left is a normal parathyroid removed from the same patient.

the connective tissue septa have been observed. Hemorrhage from the thin walled vessels is certainly the most frequent complicating feature; it is probable that the cystlike spaces so commonly described are posthemorrhagic phenomena. Areas of necrosis are not commonly reported in adenomas of the parathyroid.

We have reported 1 case in which there was infarction of an adenoma, associated with the signs and symptoms of tetany (Norris, 1946). The cause of this vascular accident was not determined.

*Histology and cytology of the adenoma.* The structural makeup of a parathyroid adenoma is subject to variability within rather wide limits. Most characteristically the parenchyma of this tumor is arranged in irregular blocks or masses of epithelial cells. These blocks or masses are closely related and are separated from each other by an extremely delicate connective tissue stroma through which a rich network of capillaries and sinusoids runs (Figs. 13 and 14). However, not a few adenomas exhibit a mixed and much more complex architecture. In some adenomas follicular structures of varying size are conspicuous (Figs. 16, 17 and 18) and in others irregular cystlike spaces are seen; indeed in certain adenomas follicular and cystic structures may predominate, with solid portions (Figs. 13 and 14) making up a relatively minor part of the tumor.

Probably the microscopic identification of a parathyroid adenoma depends more upon the recognition of cells characteristic of the parathyroid than it does upon a characteristically typical structural pattern. In the adenomas the same cellular types are to be found as are represented in the parenchyma of normal parathyroids (Norris, 1947), and the cells tend to be polyhedral bodies outlined by very distinct cell walls (Figs. 13, 14, 15 and 16).

In 1898, Welsh, after examining the parathyroid glands from 40 human cadavers at autopsy, published a description of the histology of the

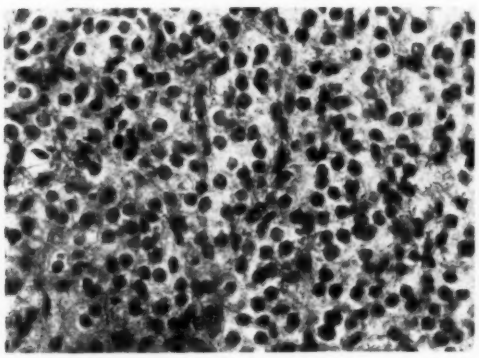


Fig. 13. Photomicrograph of an area from the adenoma shown in Figure 12. Note the monotonous character of the histological picture; from field to field the structure was practically the same. All of the cells are dense cells; only an occasional primordial or small vesicular cell is seen. (×400.)

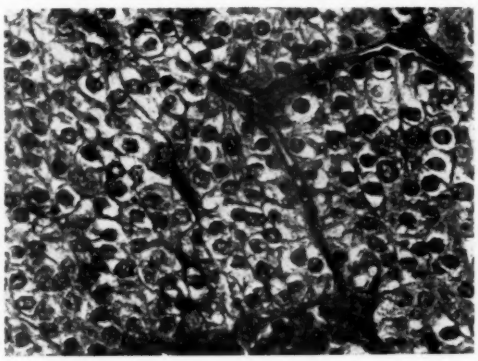


Fig. 14. Photomicrograph of an area typical of the greater part of a parathyroid adenoma. Note the delicate vascular stroma that separates the epithelial masses. Nearly all of the cells are vesicular cells; only an occasional primordial or dense cell is seen. (×400.)

normal gland and he recognized certain distinctively different types of cells. Subsequent authors, in writing their studies, have introduced other terms as suited their convenience, until now the terminology applicable to the cells of the parathyroid has become regrettably confused. This confusion is particularly unfortunate from the standpoint of our present interest because there is probably no better material for the study and delineation of the functions of the cellular elements of the parathyroid than that provided by a group of functionally active adenomas. However, little progress along this line can be made until a uniform and thoroughly understood terminology has been adopted. In a recent article, based upon the study of 1665 human parathyroids, we have recommended a terminology for the parenchymal cytological elements of these glandules and it is hoped that the use of it may lead to an understanding of the functional attributes of the different cells (Norris, 1947). When we have more information on this subject it is likely that we will be able to recognize a more constant relationship between the cytological picture of an adenoma and the associated clinical and laboratory findings. May we venture to suggest that when such a relationship can be demonstrated, it probably will be much more direct, constant, and significant than is the relationship between the size of the adenoma and the associated clinical state? We are wont to answer this rhetorical query in the affirmative because all of the cytological types I have described (primordial cells, vesicular cells, clear cells, dense cells, dark cells, and oxyphil cells) have been found in adenomas, and in many tumors particular cells have predominated almost to the exclusion of others; while in other tumors the cells have been mixed in varying proportions and include all manner of transitional forms. We are in need of more cases of primary hyperparathyroidism for which the greatest detail in the clinical history and findings have been recorded before the adenoma is removed, if a closer relationship between the cytology and functional state is to be established.

On the basis of cellular constitution, the oxyphil adenoma (a tumor consisting entirely of oxyphil cells) is probably the rarest form of parathyroid adenoma (Fig. 19). Very few such tumors have been described (Hunter and Turnbull, 1931; McQuillan, 1938; Cope, 1944; Norris, 1946). In fact, oxyphil adenomas are so unusual that some authors have contended against their existence. Care must always be exercised, of course, not to mistake for adenomas, those large islands of oxyphil cells that are commonly found in the normal glands of adults (Chown, 1937).

The cells of certain adenomas manifest a considerable degree of pleomorphism, and in some the presence of mitoses is a conspicuous finding. Indeed some adenomas show pictures that simulate invasion of their capsules by the parenchymal elements; such a picture has been interpreted by us and by others as signifying only the enclosure of peripheral cords between overlying layers of the capsule. On the other hand, such observations (cellular pleomorphism, mitoses, and capsular invasion?) have led certain authors to designate particular tumors as grade 1 carcinomas (Snell, 1936; Alexander *et al.*, 1944). From the knowledge we now possess of the parathyroid adenoma I can see small advantage in so doing; indeed the recog-

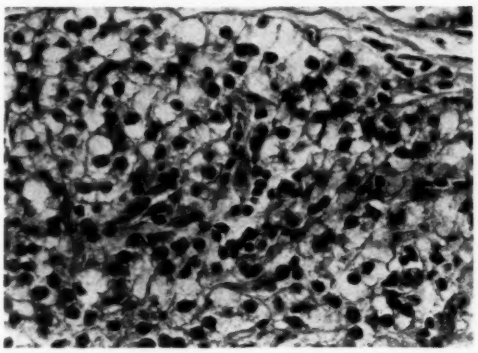


Fig. 15. Photomicrograph of an area from a parathyroid adenoma. Nearly all of the cells are small clear cells; some large clear cells are present. (×400.)

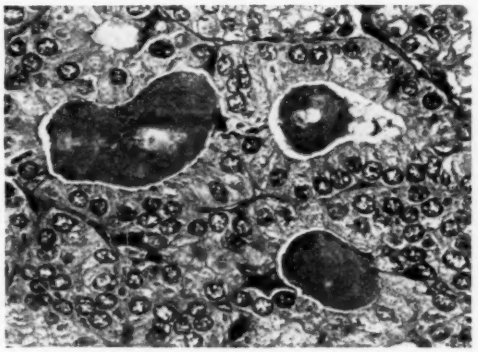


Fig. 16. Photomicrograph of a selected area in the adenoma pictured in Figure 14 to illustrate an unusual structural pattern. Note the colloid filled parathyroid follicles. Most of the cells are columnar dense cells. (×400.)

TABLE VII.—DISTRIBUTION OF ADENOMAS ACCORDING TO SEX

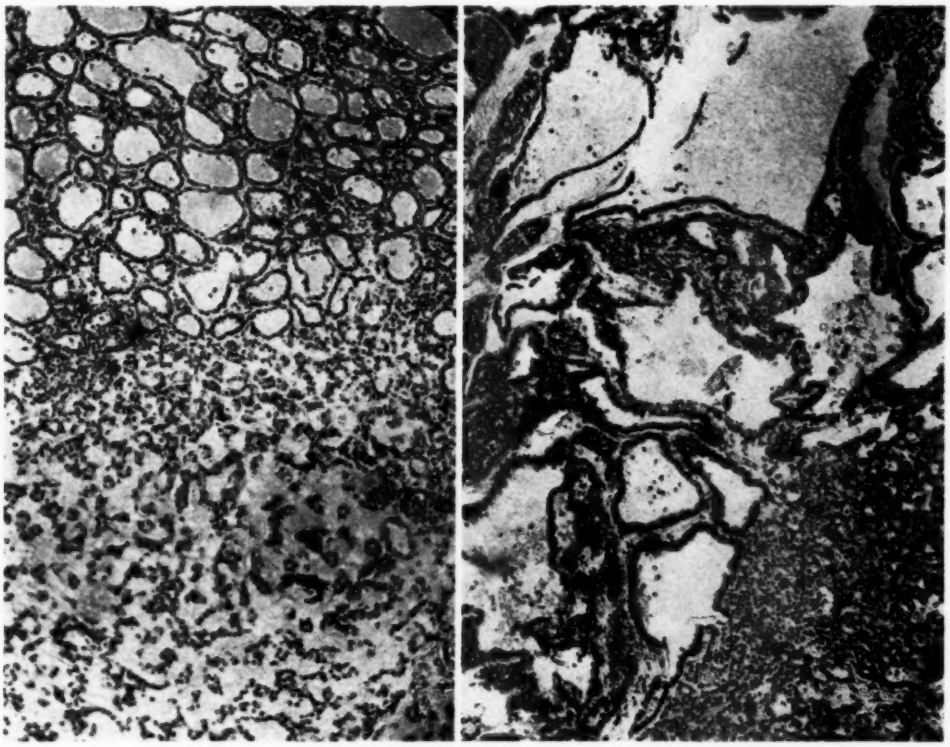
| | Male | | Female | |
|---|---|---|---|---|
| | Number of Cases | Percentage | Number of Cases | Percentage |
| Single Adenomas | 80 | 27.0 | 217 | 73.0 |
| Multiple Adenomas | 4 | 20.0 | 16 | 80.0 |

nition of grade 1 carcinoma seems rather disadvantageous and confusing, since these tumors do not invade extensively or metastasize, nor do they behave as malignant tumors in their other characteristics. It seems preferable to regard the parathyroid adenoma as a benign tumor by definition, to give up any desire to recognize a grade 1 degree of malignancy for this lesion, and to reserve the term carcinoma for those much rarer neoplasms of the parathyroid that exhibit indubitable evidence of their malignant nature.

TABLE VIII.—INCIDENCE OF OSTEITIS FIBROSA GENERALISATA AND RENAL LITHIASIS AND/OR CALCIFICATION IN ASSOCIATION WITH A PARATHYROID ADENOMA

| Associated skeletal and/or renal disease | Number of Cases | Per cent of Total (322) |
|---|---|---|
| Osteitis fibrosa generalisata *alone* | 191 | 59.3 |
| Renal lithiasis and/or renal calcification *alone* | 17 | 5.3 |
| Associated skeletal and renal lesions | 101 | 31.4 |
| *No* skeletal or renal lesions | 5 | 1.5 |
| No record | 8 | 2.5 |
| Total | 322 | 100.0 |

Histological evidence supports the concept that the parathyroid adenoma develops as a result of a



Figs. 17 and 18. Photomicrographs of two areas from the same parathyroid adenoma to show varieties of histological architecture. **Left, Illustrates the follicular structure and the arrangement of parenchymal cords in a loose lacelike pattern. Note the relatively faintly stained "colloid" in the follicles and between the cords. (×100.) Right, Illustrates a pattern made up of irregular cystlike follicular structures.**

In the lower right hand corner an area of more nearly solid structure is seen. (×100.)

localized proliferative process within one glandule. Especially in the smaller adenomas a rim of normal parathyroid tissue has been seen persisting over one surface of the tumor (Castleman and Mallory, 1935). In sections from larger tumors such remnants of normal parenchyma are less easily found because of the very size of the growth, and in the larger tumors the normal glandular tissue may have been caused to atrophy by the growth of the adenoma.

*Clinical duration and growth of the adenoma.* From the foregoing pages one may surmise that exact knowledge regarding the growth of this tumor and its clinical duration would be scant. This is indeed the case. However, the literature contains many observations that throw light upon the problem; what is more, much may now be deduced from the combined use of the data and findings we have just reviewed. For evident reasons it is important that we have precise information concerning the general biologic aspects of this neoplasm; without such information there is little hope for further improvement in the clinical management of the serious conditions of which the adenoma is provocative.

In 1934, Albright, Aub, and Bauer reported a case in which there was reason to believe from the symptoms that the adenoma had existed for 39 years. At the other extreme, a few cases are recorded in which there were no symptoms at all, the tumor having been discovered accidentally as the result of suspicion aroused by altered blood findings in the course of an examination for other purposes. Apparently very few patients in whom an adenoma has been identified have presented themselves with symptoms extending through a period so brief as 1 year. Some patients have recognized symptoms for less than 2 years, but by far the majority have histories with symptoms ascribable to the adenoma that have extended through many years prior to the diagnostic recognition of the responsible lesion. Very many patients have described symptoms that extended through a decade or even 15 or more years. There is the case of the famous Captain Martell; this man was known to have had hyperparathyroidism for 13 years, and he underwent 7 operations before the adenoma was found in the anterior mediastinum. Probably it may be concluded from the reported cases that the average duration of symptoms has been from 5 to 7 years.

All of this convinces us of two things. In the first place, the disease state with which a parathyroid adenoma is associated is cryptic at its onset and insidious in its progression. Secondly, it must again be emphasized that reports in the literature record the date at which the adenoma was finally discovered—a date in the majority of instances that is years after the time at which the tumor originated and began to produce its effects. With this latter conclusion in mind it will be well for us to reconsider our figures on the age incidence of the adenoma. If this is done while we, at the same time, have in mind the data on the weight, the size, and the histology of adenomas, we may extend our knowledge regarding the growth tendencies of this neoplasm.

As is shown in Table VI and in Figure 1, the age of the youngest patients at the time the adenoma was discovered was 14 years. Since it is likely that on the average these adenomas had been present for some years, we may believe that they had their origin during the first decade or even during the period of early childhood. Similar reasoning, applied in an effort to establish the age at the time of onset, will displace the entire incidence curve (Figure 1) to the left; the age of onset for the maximum number of cases would then be nearer to 35 or 40 years, than at 45 years as shown in Figure 1. Further support for this conclusion comes from a review of Figure 2; it will be seen that the incidence has been modified through inclusion of only the more recently reported cases—cases that in all probability were identified nearer the time of onset than the cases discovered during earlier periods. Likewise, emphatic support is given by the curve shown in Figure 3—a curve that has been altered by omitting the terminal cases in which the tumor was found at autopsy. This approach toward correction of data on the age incidence of the adenoma, in an effort to determine the time of onset, has further significance if we wish to relate the onset of parathyroid ade-

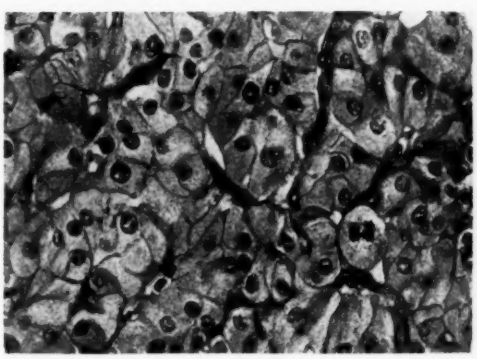


Fig. 19. Photomicrograph of a typical area in an oxyphil adenoma. Note the mitotic figure. (×350.)

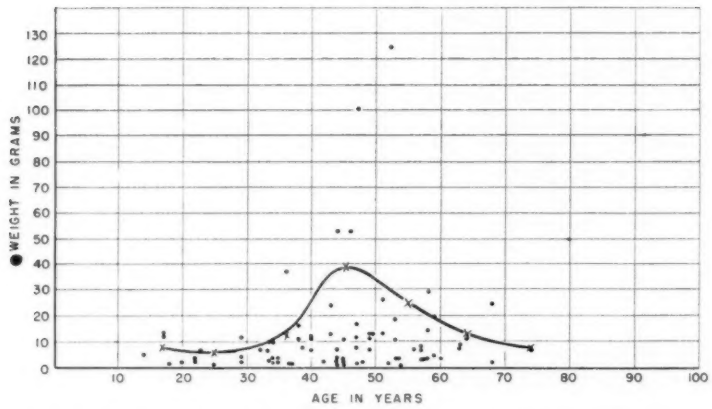



Fig. 20. In this scattergram the individual weight of 80 adenomas is plotted against the age of the patient.

nomas to such conditions as puberty, middle life, old age, pregnancy, or lactation, in which there may be a changed physiology and chemical economy (Fig. 1).

We may now turn our attention to consider the matter of the growth of the parathyroid adenoma. At the outset we are impressed by the extreme variation in size of the adenomas that have produced symptoms (from 0.4 to 120.0 gm.). Fifteen per cent of the reported adenomas attained so large a size that they caused the average value for the group to exceed the mean value by nearly 100 per cent. These large tumors must be thought of as exceptional; either they grew for a longer period of time, or their inherent growth tendencies were remarkably different from those of the majority. Table IX has been constructed to illustrate this point further. It will be seen that 41 per cent of the adenomas weighed less than 5 gm.; 20 per cent, less than 10 gm.; and 21 per cent weighed less than 15 gm. Thus more than 80 per cent attained a weight of less than 15 gm., and only about 15 per cent weighed more. This observation is strikingly shown by the scattergram and curve pictured in Figure 20; it will be seen that nearly 90 per cent of the adenomas weighed less than 20 gm. From still another viewpoint, the numerical distribution of parathyroid adenomas on the basis of their weight can be seen in Figure 21. This figure argues strongly for the concept that there are either differing inherent growth tendencies in particular adenomas, or that some few have grown for considerably longer periods of time; probably both alternatives are true. These observations are further substantiated by a study of nearly twice as many cases as those for which volume could be computed (Fig. 22).

TABLE IX.—ADENOMAS GROUPED ACCORDING TO SIZE

| Weight in Grams | Number of Adenomas | Percentage |
|---|---|---|
| 0–4.9 | 33 | 41.25 |
| 5–9.9 | 16 | 20.00 |
| 10–14.9 | 17 | 21.25 |
| 15–19.9 | 4 | 5.00 |
| 20–24.9 | 2 | 2.50 |
| 25–29.9 | 3 | 3.75 |
| 30–34.9 | 0 | |
| 35–39.9 | 1 | 1.25 |
| 40–44.9 | 0 | |
| 45–49.9 | 0 | |
| 50–54.9 | 2 | 2.50 |
| 55–59.9 | 0 | |
| 60–64.9 | 0 | |
| 65–69.9 | 0 | |
| 70–74.9 | 0 | |
| 75–79.9 | 0 | |
| 80–84.9 | 0 | |
| 85–89.9 | 0 | |
| 90–94.9 | 0 | |
| 95–99.9 | 0 | |
| 100–104.9 | 1 | 1.25 |
| 105–109.9 | 0 | |
| 110–114.9 | 0 | |
| 115–119.9 | 0 | |
| 120–124.9 | 1 | 1.25 |
| Total | 80 | 100.00 |

Histologically, the variability in the number of mitoses from case to case, argues for periodicity of growth, and for changes in the rate of growth. In some adenomas mitoses are numerous, while in others none can be found. To speculate regarding the significance of periodic growth of the adenoma seems useless until we know more about the rela-

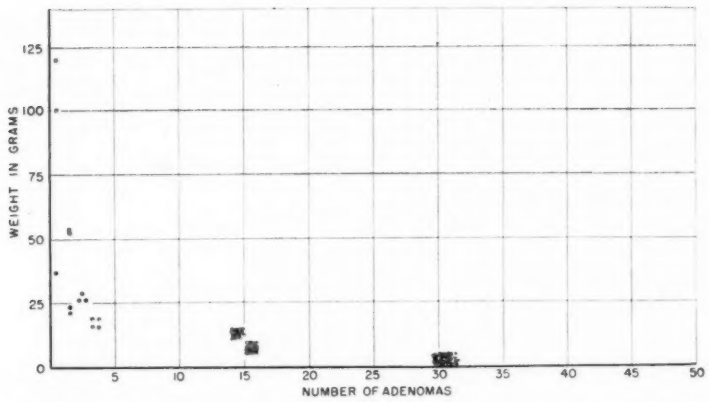



Fig. 21. In this scattergram 80 adenomas have been assembled into groups that differed by 5 gm. in weight, and distributed on the chart according to this weight grouping and according to the number of adenomas in each group.

tionship of cell types to function, and more concerning the endocrine relation of the tumor to the general physiology of the body.

In summary of this analysis several conclusions seem warranted. The cryptic nature of primary hyperparathyroidism makes it impossible to determine the exact time of onset; however, such knowledge as we have of the incidence and growth tendencies of this tumor, seems to indicate that it may originate in a particular individual at any time from childhood to old age. Furthermore, the insidiousness with which the malady progresses imposes difficulties in judging of the duration of the disease prior to recognition of the adenoma; although subject to acute clinical crises, the disease is essentially chronic and slowly progressive. As the result of a wider dissemination of more accurate knowledge of the disease and its diagnostic problems, more cases of hyperparathyroidism have been recognized during the last decade than in the years that preceded. However, when the cases reported between 1936 and 1945 were segregated, the weights and volumes produced scattergrams quite similar to those shown in Figures 20 and 22. Indeed, as may be seen in Figure 22, the largest adenoma thus far reported occurred in an individual 25 years of age. It therefore appears that certain adenomas grow more rapidly than others (perhaps periodically), and that their size is not wholly dependent upon duration. Certainly the reports in the literature substantiate the conclusion that as the tumor increases in size its clinical effects are proportionately less.

*Pathological physiology of the adenoma.* In the last few years considerable progress has been made in the understanding of both the normal and the pathological physiology of the parathyroid glands. A recent article by Pope and Aub (1944) presents a comprehensive review of this progress.

As we have learned, the parathyroid adenoma is a benign neoplasm which in practically all, if not in all, instances affects the body's economy through the excess of parathyroid hormone generated in the tumor. The parathyroid adenoma is, therefore, an endocrinologically active tumor, and the diseased state produced by the presence of the adenoma is the direct result of an oversupply of the hormone. So far as we know, the secretion generated by the adenoma is the same as that elaborated by normal parathyroids; consequently the effects produced in the body result from the continued activity of an abnormally large amount of the secretion. In this connection it should be pointed out that there is need for more reports on the bioassay of adenomas (Moolten, Clarke, and Haywood, 1937; Rutishauser, 1941). Assays of more adenomas would seem to offer the best objective approach to the problem. However, a note of caution may be sounded: in the first place, there are possible sources of error; and, secondly, the findings from assays are not necessarily indicative of the behavior or of the fate of the hormone in the body.

In studying the altered physiology produced by the adenoma we become interested in the subject of mineral metabolism and its control by the endocrine glands. The recent literature contains a

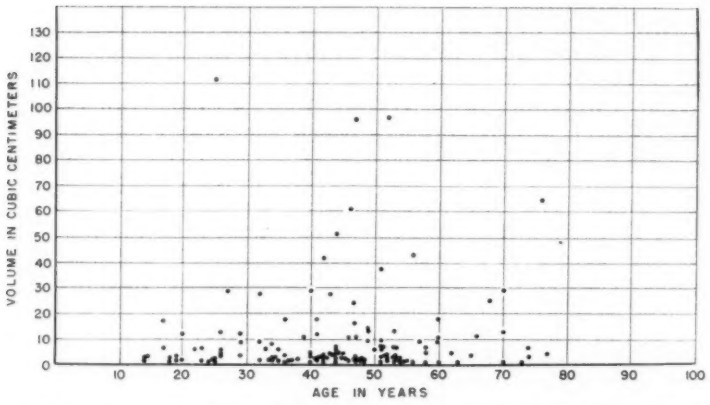



Fig. 22. In this scattergram the individual estimated volume in cubic centimeters of 140 adenomas is plotted as a dot. Nearly twice as many cases were available for the construction of this chart as appear in Figure 20. Note that the adenoma having the greatest volume occurred in an individual 25 years of age. In general, this scattergram confirms the evidence recorded in Figure 20.

number of excellent reviews in this field. Since the comprehensive review of calcium and phosphorus metabolism by Schmidt and Greenberg in 1935, other studies have appeared, concerned with the same topic and with the chemistry of calcification and the physiology of bone, by Greenberg (1939), Cohn, Cohn, and Aub (1942), Logan (1940), MacLean (1943), Guest and Rapoport (1941), and by MacLean (1941). In 1942 Campbell and Turner reviewed the literature on the relation of the endocrine glands to calcium metabolism, and studies on special aspects of this problem have appeared by Albright (1941), Anderson (1939), Bodansky and Duff (1939), MacLean (1941), and by Silberberg and Silberberg (1943).

Such information as we have indicates that the parathyroids can function in the absence of the anterior lobe of the pituitary gland; if there is an endocrine relationship between these two organs it is not so direct or so close as is the case with certain other ductless glands and the pituitary (Campbell and Turner, 1942).

The terminal results from the action of the parathyroid hormone are well known; however, the exact manner in which the hormone affects these results remains a matter of conjecture. There are two theories regarding the action of the parathyroid hormone, and for each there is considerable support in the nature of experimental evidence. The theory of Collip (1932) holds that the chief action of the parathyroid hormone is directly on the solution of calcium salts from bone. On the other hand, the theory of Albright (1929) postulates the chief action of the parathyroid hormone to be that of promoting the renal excretion of phosphate.

The hormone acts to increase the excretion of calcium; if insufficient calcium is being absorbed from the intestine, decalcification of the bones will result. Perhaps those clinical cases that show no skeletal decalcification may find their explanation in the protection that comes from a diet rich in calcium. Why certain patients manifest a form of generalized osteoporosis and why others develop the bizarre picture of osteitis fibrosa cystica is not understood; possibly the latter condition develops in those patients in whom the loss of calcium is very rapid.

The increased output of calcium by the kidney results in supersaturation of the urine with this element. The calcium precipitates out as a phosphate salt (alkaline urine) or as calcium oxalate (acid urine) and calculi may be formed anywhere in the urinary tract. If the precipitation occurs in the lumens of the renal tubules, casts of calcium phosphate are formed. Not infrequently, calcium is deposited in the renal parenchyma, which produces calcification of the kidney and a gradual impairment of renal function. Since it appears that, on the whole, those cases of hyperparathyroidism that develop renal complications are milder than those with extensive osseous involvement, and since calcification of the kidney may develop early in the malady, renal calcification may progress to lethal proportions before the underlying condition is

recognized. Cope (1944) has very clearly described the ensuing picture:

"The development of renal impairment alters the characteristics of the disordered metabolism. With progressive renal calcification or nephritis from ascending sepsis, the kidney fails to excrete the excess calcium with which it is burdened by the overactive parathyroid glands. The excess, however, is excreted by the large bowel, and the calcium level of the blood remains as before. If renal impairment continues there may be less calcium than normal in the urine.

"With impairment, the kidney also fails to excrete phosphate, chloride, and nonprotein nitrogen. The levels of these three substances rise in the blood. The phosphate may rise from its abnormal, low level to normal or even above. When it is above normal it may tend to depress the elevated calcium. When retention of these substances occurs, the urine has a fixed low specific gravity, usually without albumin. The kidney function, as judged by the phenolsulfonphthalein excretion, may be but little depressed." And it is in this manner that a fatal degree of renal insufficiency may become associated with an otherwise relatively mild case of hyperparathyroidism (Mayer, 1941).

*Clinical complications of the adenoma.* We have seen how the disease condition provoked by a parathyroid adenoma is an entity known as primary hyperparathyroidism, the result of the continued presence of an excess of the parathyroid hormone. As this state endures through months and even years of time, certain complicating changes develop in the body in varying frequency and in varying degrees of intensity. The chief complications involve the elements of the skeletal system and the upper urinary tract. Indeed, changes are so common in these anatomic systems that by many they have come to be thought of as the disease condition itself; in our series of 322 cases, only 1.5 per cent of the adenomas failed to produce any clinically recognizable skeletal and/or renal changes (Table VIII).

The figures in Table VIII indicate that the skeletal and renal changes may occur, in particular patients, either alone or together. In the present series of cases clinically recognizable changes in the bones were found in 90 per cent, while the urinary tract showed involvement in only 36 per cent of the cases. The effects of the hyperparathyroidism were confined to the osseous parts alone in 60 per cent of the cases, to the urinary tract alone in only about 5 per cent, and in particular patients there were changes in both the skeletal and renal tissues in a little over 30 per cent of the cases. In addition to these common complications, a few authors have described the occurrence of metastatic calcification in soft tissues other than those of the kidney.

Cope (1944) believes that complications affecting the urinary tract are more common in hyperparathyroidism than are those affecting the skeleton. He also states that renal complications are more likely to be associated with milder states of hyperparathyroidism and that the bony changes tend to be more prominent in the severer forms of the disease. Albright, Baird, Cope, and Bloomberg (1934) assume that the degree of the bone changes is related to the duration of the disease rather than to its severity.

The renal complications are the direct result of the high concentration of calcium in the urine; calcium may be precipitated out from the urine in any part of the urinary tract from the renal tubules to the bladder, with the formation of casts or stones. Not infrequently the precipitation of calcium occurs in the parenchyma of the kidney itself. No matter where it occurs, the precipitation leads to greater or lesser degrees of disturbance of renal function; many patients have been operated upon for calculi before the underlying condition was recognized.

The osseous changes are due to the removal of abnormal amounts of calcium from the bones. At times this results in the picture of a diffuse osteoporosis and in other cases the bizarre picture of osteitis fibrosa cystica is produced. The bones become softened and fragile so that deformities and pathological fractures occur. These pathological changes (Figs. 23 and 24) have been experimentally reproduced in animals (Yaffe, 1933).

It is of interest to know that, according to Denninger (1931), osteitis fibrosa generalisata existed in America in prehistoric times. Lesions interpreted to be those of this condition were found in the skeleton of a primitive American Indian that was discovered in Northern Illinois.

*Clinical features associated with the adenoma: primary hyperparathyroidism.* The clinical state associated with the adenoma is known as primary hyperparathyroidism. It is called 'primary' because the adenoma is thought of as an autonomous neoplasm, and the term 'primary' further distinguishes the effects produced by this tumor from other conditions in which enlargement and overactivity of the parathyroids result as secondary effects, due to certain prefatory diseases (chronic renal insufficiency, rickets, etc.). By definition, therefore, primary hyperparathyroidism is the clinical condition associated with, and provoked by, the presence of a parathyroid adenoma,

in which the signs and symptoms are engendered by the excess of parathyroid hormone secreted by this tumor.

Primary hyperparathyroidism may be discovered at any period of life from midchildhood to old age. The youngest patient from whom an adenoma has been removed was less than 14 years old at the time of her operation, and symptoms had been present since the age of 9 (Anspach and Clifton, 1939). The oldest patient was 77 years of age at the time of her operation (Gamberini, 1935). The maximum incidence is between 30 and 60 years.

Primary hyperparathyroidism is 3 times more frequent in females than in males.

The average duration of the symptoms prior to the discovery of the adenoma has ranged from 5 to 7 years, and the persistence of symptoms through such a long period attests the cryptic nature of the malady. The literature records 1 case in which there is reason to believe that the symptoms had existed for 39 years (Albright, Aub, and Bauer, 1934).

Because, on the average, a parathyroid adenoma remains small, it relatively rarely produces mechanical symptoms. Occasionally it may cause dysphagia or a feeling of fullness in the neck. Probably in no more than 10 per cent of the cases has the adenoma been palpable, or has it displaced the thyroid so that distortion of the cervical contours was noticeable. A few adenomas, in aberrant positions, have been visualized in roentgenograms of the chest.

Lassitude, asthenia, and fatigue are usually complained of and result from the muscular hypotonia that is caused by the associated hypercalcemia. Occasionally the increased excretion of calcium may produce polyuria and polydipsia. Loss of weight, and at times vaguely connected gastrointestinal symptoms, such as impaired appetite, constipation, indigestion, nausea, and vomiting, may be mentioned. Among their chief symptoms some patients list pain in the extremities or pain over other skeletal parts, and a few have noted loss of height and the development of kyphosis.

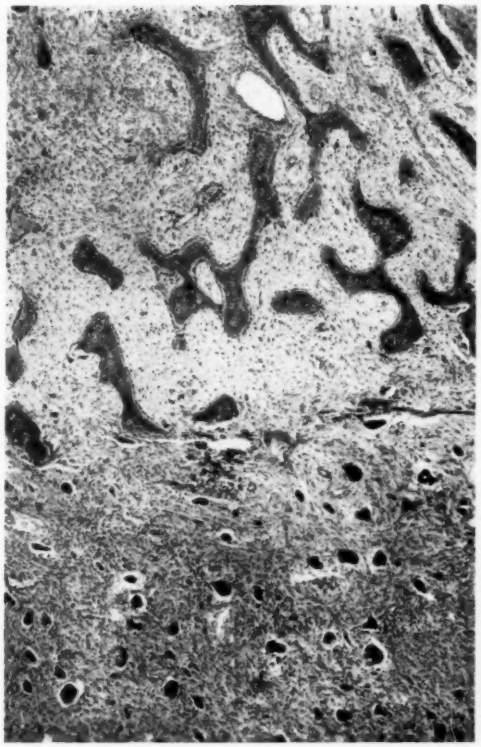
This recitation serves to emphasize the fact that primary hyperparathyroidism has no specific symptoms. Indeed, the very lack of specific symptoms has made the malady clinically unrecognizable, except in rare instances, until its complications have become evident. The differential diagnosis in the incipient period will always be difficult, and the early recognition of cases will depend almost wholly upon the enthusiasm and vigilance of the physician.

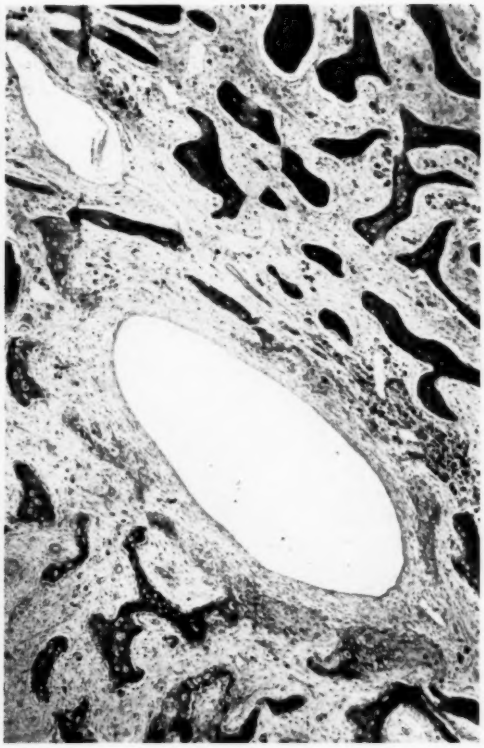
Hypercalcemia and hypophosphatemia are the two most prominent laboratory findings. Generally, the blood serum calcium value will be between 11 and 16 mgm. per cent and the phosphorus value between 2 and 4 mgm. per cent; as the concentration of calcium increases in the serum, the phosphorus level is depressed. Hypercalcinuria is commonly demonstrable. Studies of the serum phosphatase have not yielded such constant or dependable results, although in many cases the concentration has been elevated. Consequently, any patient with indefinite complaints, with hypercalcinuria, and with blood which contains an excess of calcium and a diminished amount of phosphorus should be re-examined and his condition investigated until hyperparathyroidism has been excluded.

The clinical course of primary hyperparathyroidism is characterized by its insidious onset and by its cryptic, chronic progression. The course is likely to be interrupted by such seemingly unrelated incidents as renal colics, the passage of renal calculi, spontaneous fracture of the bones, the development of postural deformities, or the appearance of tumorlike swellings on the skeletal parts. All of the latter, when recognized for their true-nature, are the more dramatic indications of complications that develop in cases of primary hyperparathyroidism.

At times the course may be interrupted by crises during which the patient suffers from acute poisoning by the parathyroid hormone. Crises of this type are sometimes referred to as 'acute hyperparathyroidism'; exemplary cases have been described by Dawson and Struthers (1923), Hanes (1939), Oliver (1939), Smith and Cooke (1940), and by Alexander *et al.* (1944). In such attacks the patient exhibits restlessness, tachycardia, and prostration, and may succumb. Rogers (1946) described a case in which uncontrollable vomiting preceded death. On the whole patients with primary hyperparathyroidism remain ambulatory, are disturbed by a variety of indefinite, nonspecific symptoms, and progress slowly, through periods of disability due to exaggerated distress from complications, to a state of chronic invalidism. This tragic course can be interrupted only by the diagnostic recognition of the condition and by the removal of the adenoma.

So prominent are the complications of primary hyperparathyroidism that they have often been regarded as the disease itself, and many times therapy has been directed toward them without recognition of the underlying responsible lesion. The most conspicuous complications involve the skeleton and the kidney.





Figs. 23 and 24. Two photomicrographs from biopsies taken from the ilium of 2 patients, each suffering from the effects of a parathyroid adenoma. These figures illustrate the skeletal lesion known as osteitis fibrosa generalisata. The replacement of the marrow spaces by fibrous tissue is well shown. In the lower part of Figure 23 numerous giant cells are scattered through the fibrous tissue. In the upper part of Figure 23 a tiny cyst is present. Near the center of Figure 24 a large cyst is seen, and just above and to the right, a considerable accumulation of pigment. (× 50.)

We have already seen how 90 per cent of the reported cases have shown clinically recognizable involvement of the osseous tissues. The skeletal lesion in primary hyperparathyroidism is called "osteitis fibrosa generalisata," a disease that manifests itself in two forms. The more common form is described by the term osteitis fibrosa cystica, because of the cystlike areas of rarefaction that appear in the bones. Very many of the bones may be affected, or the lesions may be sparsely and irregularly scattered through the skeleton. The less common form shows a diffuse decalcification of the skeletal parts and is spoken of as the diffuse osteoporotic form; the bones become flexible and rubbery in advanced stages of this condition. Although these two forms of osteitis fibrosa generalisata are recognizable, it is quite common to find evidence of each form in the same case.

Despite the fact that in our series of cases only 36 per cent showed involvement of the urinary tract, Cope (1944) states that "the commonest complication of hyperparathyroidism is precipitation of calcium in the urinary tract." Doubtless this apparent discrepancy is due to several facts: first, many of the cases reported in the literature developed through long periods of time; second, a better knowledge concerning the association of renal lesions has come in recent years; and, finally, probably greater attention has been paid to the renal function in hyperparathyroidism at the Massachusetts General Hospital than in many other places.

The urinary system is affected in four ways in hyperparathyroidism: the excretion of calcium in the urine tends to be increased; calcium casts may form in the renal tubules; there may be cal-

TABLE X.—CLINICAL STAGES OF PRIMARY HYPERPARATHYROIDISM

| | | |
|---|---|---|
| Stage I | Period of Inception | Brief history of lassitude and fatigue associated with hypercalcemia, hypophosphatemia and hypercalcinuria. No demonstrable findings by means of roentgenograms in bones or kidneys. |
| Stage II | Period of Early Complications | Longer history of lassitude, fatigue, and perhaps polyuria, polydypsia, and indigestion. History of one or two bouts of renal colic. History of pains in the extremities. Possibly one spontaneous fracture. Possibly history of a tumorlike growth on a bony part. Roentgenograms may demonstrate a renal calculus or a moderately well developed picture of osteitis fibrosa generalisata. Hypercalcemia, hypophosphatemia and hypercalcinuria. |
| Stage III | Period of Advanced Complications | Long period of debility with loss of weight. Long continued history of renal colics, polyuria, and polydypsia. Roentgenograms demonstrate renal calculi and/or calcification. Long continued history of pains in extremities and over bony parts. History of tumorlike growths on bony parts. Possible history of several spontaneous fractures. Skeletal deformities. Roentgenograms show widespread and extensive evidence of osteitis fibrosa generalisata. Hypercalcemia, hypophosphatemia, and hypercalcinuria. Possibly albuminuria. |
| Stage IV | Period of Irreparable and Lethal Damage | Prolonged period of debility through many years, with loss of weight and malnutrition. Prolonged history of body pains and renal colics. Albuminuria, low fixed specific gravity in the urine; nitrogen retension in the blood with evidence of marked renal insufficiency. History of many spontaneous fractures. Skeletal deformities. Roentgenograms demonstrate extensive deposits of calcium in the kidneys with renal calculi; also skeletal deformities and widespread, extensive evidence of osteitis fibrosa generalisata. Only moderate hypercalcemia, hypophosphatemia, and hypercalcinuria (due to renal failure). |

cium deposits in the renal parenchyma; and the formation of urinary calculi is common.

Many authors have attempted to classify the cases of primary hyperparathyroidism into clinical groups, depending for the most part upon the presence of findings in the bones or in the kidney. Such efforts seem to exaggerate the importance of prominent complications, and they do little to indicate the true nature of the disease. In our opinion it is preferable for us, as clinicians, to have a comprehensive, practical knowledge of hyperparathyroidism and its complications that will lead us early and directly to the offending adenoma. At least for the present there seem to be no good reasons to recognize clinical types. On the other hand, some advantage may come from the recognition of clinical stages in the progress of the disease, especially if such a subdivision tends to aid in the earlier identification of sufferers. An arbitrary subdivision of primary hyperparathyroidism into four clinical stages is proposed in Table X.

The differential diagnosis of primary hyperparathyroidism has been presented in many articles, such as those of Fox and Taglia (1943) and Flink (1945).

*Therapy.* The only effective treatment for primary hyperparathyroidism is the surgical removal of the etiologically associated parathyroid adenoma. The majority of surgeons have performed total extirpation of the adenoma in a single operation with results that have been, on the whole, gratifying. Cope (1944), however, recommends an occasional subtotal resection of the adenoma "in the presence of extensive bone disease." This author also recommends a two stage operation for cases in which the adenoma, not discovered during the initial cervical exploration, must be sought in the mediastinum.

Roentgen therapy for the parathyroid adenoma has been ineffectual. From the structure of the tumor this negative effect would probably accord with the judgment of most pathologists. Reports in the literature of cases benefited by roentgenotherapy include insufficient data on the calcium and phosphorus metabolism to assume that the clinical improvement may not have been due to diet alone.

Thus far the medical management of primary hyperparathyroidism has been unsatisfactory. Although a high calcium diet may influence recalcification of bones in the presence of an active adenoma, the kidney damage is likely to be accelerated by the increased intake of calcium.

*Postoperative course and results from surgical management.* Although no statistics are available on extensive series of cases, one obtains the impression from the literature that the immediate postoperative mortality from the removal of parathyroid adenomas has not been high. However, as many authors have pointed out (Churchill, 1936; Cope, 1941; Moehlig and Ulch, 1946) the technical and anatomical features of the operation are such that the task should be undertaken only by especially qualified surgeons. A satisfactory exploration for, and the removal of, a parathyroid adenoma demand knowledge, experience, and technical skill of a type not necessarily possessed by surgeons expert in dealing with diseases of the thyroid gland. It must be borne in mind that the problems of parathyroid surgery are not alone those of the regional anatomy of the neck, but are specifically peculiar to the embryology, anatomy, and physiology of the parathyroid glands. The principles and technique of the surgery of the parathyroids are beautifully and thoroughly presented in articles by Churchill (1936) and Cope (1941).

In the management of cases of primary hyperparathyroidism the surgeon needs the close collaboration of an experienced internist. It is of the

utmost importance that the preoperative diagnosis be firmly established and that the surgeon be convinced of the accuracy of the diagnosis. The surgeon needs this fortification because *the accuracy of diagnosis in this disease cannot be disproved by a single exploratory operation.* Furthermore, the surgeon needs this assurance for he must do a most meticulous and thorough dissection to find a small adenoma and, at the same time, he must identify and carefully preserve the normal parathyroids.

Within the first few hours after the removal of the adenoma a precipitous fall in the blood serum calcium level regularly occurs; therefore the danger of postoperative tetany is always imminent. Churchill and Cope (1936), Cope (1941), and Albright with his associates (1937) have demonstrated that the higher the levels of serum phosphatase preoperatively the greater the likelihood of postoperative tetany. Consequently, if the preoperative phosphataze level is high, postoperative tetany should be looked for and treated as soon as its premonitory symptoms appear (Flink, 1945).

Many patients have noted a remarkable improvement in their subjective well-being even in the immediate postoperative period. Of course, the organic improvement is likely to be best in those cases in which the complications of hyperparathyroidism are least developed. In general the late postoperative results have been good, but as they are unpredictable in particular cases only a guarded prognosis can be given. Voltz and Smull (1944) presented a case in which, despite any evidence of the continuance or recurrence of hyperparathyroidism, there was failure of recalcification of the bones 5 years following the removal of the adenoma. Discouraging results of this type, in which the bones fail to recalcify even in the face of normal serum calcium levels, may be attributed to arrested osteoblastic activity (Gutman and Parsons, 1938; Voltz and Smull, 1944). On the other hand, Sprunt (1938) reported a case that had a long history and extensive skeletal involvement, in which there was nearly complete recalcification of the bones by the eighth postoperative month. Fortunately many cases have responded similarly well, and it is to be expected that as more patients come earlier to surgery more will obtain better results.

*The parathyroid adenoma in medicine of the future.* It cannot be doubted but that in the future fewer cases of parathyroid adenoma will be allowed to endure through such long periods as in the past. More cases will be recognized early in their course and will be removed before extreme complications have developed. The shortened duration of the disease should favor the recording of more accurate and more detailed clinical histories and this will aid in fixing the time of onset. Such data will be invaluable in refining our knowledge of the growth potentialities of the adenoma. Preoperatively, it is hoped that careful laboratory studies will be made repeatedly, and through a long enough period so that they will throw more light upon the disturbed physiology. These studies are much needed in order that it may be decided whether a quantitative relation exists between the disturbed mineral metabolism and the size and histological structure of the tumor. Postoperatively the tumor should be accurately weighed in grams and measured in centimeters. After the gross description has been recorded and portions selected for microscopic study, the remainder of the adenoma should be subjected to bio-assay.

It is desirable that all cases of primary hyperparathyroidism be published; the more complete data to be presented in the reports of the next decade will go far in answering the unsolved problems attached to this malady. Finally, it should be emphasized that a thoroughgoing knowledge of the parathyroid adenoma will not only be valuable from the point of view of understanding this particular tumor, but it is likely that accurate and detailed knowledge of the parathyroid adenoma may shed light upon problems connected with other endocrinologically active tumors and possibly even upon the abstruse problems of neoplasia in general.

## SUMMARY

1. Surgical management of the parathyroid adenoma holds a place among the triumphs of modern surgery.

2. Operative removal of the parathyroid adenoma is the only effective treatment of this lesion and the associated primary hyperparathyroidism.

3. Historically, the clinical surgery of parathyroid disease is recent and has been crowded into the brief period of the last 20 years.

4. Although the parathyroid adenoma is not a common tumor, its general incidence is probably greater than is suspected.

5. During the 43 years from 1903 to 1945, reports of 322 cases of parathyroid adenoma have appeared in the literature.

6. No exact figures are available to indicate the incidence of parathyroid adenomas, either in groups of individuals or in series of surgical cases.

7. In approximately 80 per cent of the cases reported prior to 1936 the adenomas were removed

at operation and in 20 per cent they were discovered at autopsy. Better knowledge of primary hyperparathyroidism has altered these figures; in the decade from 1936 to 1945, nearly 90 per cent were removed surgically and only about 10 per cent were found at autopsy.

8. There is no evidence to support the concept that the incidence of the parathyroid adenoma is influenced by geography.

9. The exact time of origin of a parathyroid adenoma is difficult to establish; however, analysis of the available data indicates that this tumor may originate at any time from midchildhood to old age.

10. Parathyroid adenomas have been found in each decade from the second to the eighth, inclusive. For our total group the maximum incidence is in the fifth decade and 70 per cent of the adenomas were discovered in patients between 30 and 60 years of age.

11. The sex incidence of the parathyroid adenoma shows a preponderance in females over males in the ratio of approximately 3 to 1.

12. On the basis of sex there is a difference in the age distribution of parathyroid adenomas; the maximum incidence occurs a decade earlier in males than in females, and there is a qualitative difference in the age-sex distribution curves (Fig. 4).

13. Multiple adenomas were described in 20 instances, or in 6.2 per cent of the reported cases.

14. The question of multiple adenomas is discussed and the possibility of confusing supposed examples with cases of secondary hyperplasia of the glandules is pointed out. It is concluded that, up to the present time, the evidence for the existence of true multiple adenomas is meager.

15. In the great majority of cases the parathyroid adenoma is a single lesion that develops in, and therefore involves only 1 of, the parathyroid glandules.

16. As the neck is entered to treat hyperparathyroidism, the first problem of the surgeon is to determine the site of the adenoma.

17. Adenomas of the parathyroid glands are about equally frequent on the right and left sides of the neck, but when the incidence of involvement of the inferior and superior glands is considered a great difference is apparent.

18. Fifty-one and six tenths per cent of the adenomas occurred on the right side and 47.4 per cent on the left side of the neck.

19. Forty-two and seven tenths per cent of the adenomas were located in the region of the right lower parathyroid; 41.1 per cent, in the region of the left lower; 9.1 per cent, in the region of the right upper; and 7.1 per cent were located in the region of the left upper parathyroid.

20. In 10.7 per cent of the cases the adenoma was found in an aberrant position; in 63.3 per cent of this group, it was in the mediastinum; in 30 per cent, within the substance of the thyroid gland, and in 6.7 per cent, it was behind the esophagus.

21. On the basis of this data on the location of the adenoma, a formula for the scientific, surgical approach to an adenoma is suggested (page 18, Table V).

22. The size of the adenoma is the second problem of the operating surgeon.

23. The weights of individual adenomas have varied through an extreme range; the smallest weighed 0.4 gm., while the largest attained a weight of 120 gm. The average weight was 12.7 gm. and the mean weight 7.0 gm.

24. For the most part the surgeon will be searching for a tumor with a weight approaching 7.0 grams, a volume approximating 4 or 5 c.c., and with diameters which may vary from a mean of about 3.2 by 2.1 by 1.7 cm.

25. The smallest adenoma was more than 10 times the size of a normal parathyroid gland, while the largest adenoma was 3,500 times as large as a normal glandule.

26. By means of the blood calcium levels, it has been possible to demonstrate a roughly quantitative relationship between the size of the tumor and the degree of hyperfunction. However, as the size of the adenoma increases the proportional effect of unit weight on the blood calcium becomes rapidly less and less.

27. Bio-assays of parathyroid adenomas indicate that these tumors contain a hormone that is similar to, if not identical with, that produced by the normal gland.

28. Most parathyroid adenomas are yellowish brown or reddish brown in color, moderately soft, encapsulated, and with smooth surfaces. Although some are bilobed, most of them are ellipsoidal in form.

29. Histologically, the parathyroid adenoma is recognized because of its fairly typical structural pattern, but more particularly because of the presence of characteristic parathyroid cells.

30. All of the 6 types of parenchymal cytological elements found in normal glandules (Norris, 1947) may be found in adenomas of the parathyroid; these may be present in varying proportions in particular tumors.

31. An adenoma made up entirely of oxyphil cells (oxyphil adenoma) is a rare and probably special form of tumor.

32. The literature records a case in which there is reason to believe the adenoma had existed for 39 years.

33. Few patients have recognized symptoms ascribable to the adenoma for a period less than 2 years.

34. It is probable that the average duration of symptoms has been from 5 to 7 years prior to the recognition of the adenoma.

35. There is evidence to support the concepts that adenomas may exhibit a periodicity in their growth and that there are differing inherent growth tendencies in particular adenomas.

36. It appears that the incidence of parathyroid adenomas rises as the keenness of diagnostic acumen increases. During the years of the past decade more and more cases have been given the benefit of earlier surgery and fewer cases have been left to be discovered at autopsy.

37. It is recommended that confusion be avoided by confining the use of the term "carcinoma" to those very rare tumors of the parathyroid that exhibit indubitable evidence of their malignant nature.

38. The parathyroid adenoma is a benign, endocrinologically active neoplasm which in practically all, if not in all, instances affects the bodily economy through the excess of parathyroid hormone generated by the tumor.

39. The terminal results from the action of the parathyroid hormone are well known; however, the exact manner in which the hormone affects these results remains a matter of conjecture.

40. The clinical disease provoked by a parathyroid adenoma is known as primary hyperparathyroidism.

41. Primary hyperparathyroidism is characterized by its insidious onset and by its cryptic, chronic progression. There are no specific symptoms.

42. Few cases of primary hyperparathyroidism are recognized prior to the appearance of complications that involve either the skeletal, the urinary, or both of these anatomic systems.

43. The skeletal involvement in primary hyperparathyroidism (called osteitis fibrosa generalisata) is common and takes one of two forms: osteitis fibrosa cystica and diffuse osteoporosis.

44. The roentgen findings of osteitis fibrosa generalisata are characteristic.

45. Osteitis fibrosa generalisata may lead to the development of deformities and spontaneous fractures, and commonly produces pain, of which the patient complains, in the bones and joints.

46. Following removal of the adenoma there has been a spectacular and complete recalcification of the bones in some cases, while in others there has been little postoperative reformation of the skeletal parts.

47. The renal complications of primary hyperparathyroidism are due to hypercalcinuria, and to the precipitation of calcium salts in the renal parenchyma, or in the renal tubules and excretory passages.

48. Clinically, the cases of primary hyperparathyroidism showing renal complications are likely to be less severe than those in which the osseous changes are more prominent.

49. Apparently more and more parathyroid adenomas have been discovered during recent years in urological clinics.

50. The clinical course of primary hyperparathyroidism is likely to be interrupted by such incidents as the appearance of skeletal deformities, spontaneous fractures, renal colics, and the passage of renal calculi.

51. Untreated cases of primary hyperparathyroidism progress to invalidism and death from renal insufficiency, malnutrition, or other intercurrent malady.

52. Apparently no advantage is gained from the classification of cases of primary hyperparathyroidism into clinical groups.

53. It is recommended that four clinical stages of primary hyperparathyroidism be recognized: (1) period of inception; (2) period of early complications; (3) period of advanced complications; (4) period of irreparable and lethal damage.

54. The only effective treatment for primary hyperparathyroidism is the surgical removal of the etiologically associated adenoma.

55. The problems of parathyroid surgery are not alone those of the regional anatomy of the neck, but are specifically peculiar to the embryology, anatomy, and physiology of the parathyroid glands.

56. At least for the next decade all cases of parathyroid adenoma should be reported. To be most useful the published reports will contain accurate and detailed clinical histories and findings, repeated laboratory studies, weights and measurements of the tumor, careful histological and cytologic descriptions, and bio-assays of the adenomas.

## REFERENCES

1. Abel, A. L., Thomson, G., and Hawksley, L. M. Lancet, Lond., 1933, 2: 525–529.
2. Albright, F. J. Am. M. Ass., 1941, 117: 527–533.
3. Albright, F., Aub, J. C., and Bauer, W. J. Am. M. Ass., 1934, 102: 1276–1287.
4. Albright, F., and Ellsworth, R. J. Clin. Invest., 1929, 7: 183–201.

5. ALBRIGHT, F., SULKOWITCH, H. W., and BLOOMBERG, E. Am. J. M. Sc., 1937, 193: 800–812.
6. Idem. Arch. Int. M., 1938, 62: 199–215.
7. ALEXANDER, H. B., PEMBERTON, J. D., *et al.* Am. J. Surg., 1944, 65: 157–188.
8. ALLAN, F. N. Proc. Mayo Clin., 1931, 6: 684–689.
9. ALLOTT, E. N., and JEMSON, J. Lancet, Lond., 1938, 1: 609–611.
10. AMICO, D. Riv. neur., Nap., 1937, 10: 61–71.
11. ANDERSON, W. A. D. Arch. Path., Chic., 1939, 27: 753–778.
12. Idem. Endocrinology, 1939, 24: 372–378.
13. ANDRE, H. M., SCHNOOR, E. W., and VAN SOLKEMA, A. J. Michigan M. Soc., 1943, 42: 195–197.
14. ANSPACH, W. E., and CLIFTON, W. M. Am. J. Dis. Child., 1939, 58: 540–557.
15. ARMSTRONG, H. G. Bull. Acad. M., Toronto, 1938, 11: 105–110.
16. ARNOLD, W. Virchows Arch., 1940, 306: 427–466.
17. ASKANAZY, M. Teub. Path.-anat. Inst. Arb., 1902–1904, 4: 398–422.
18. ASK-UPMARK, E. Acta med. scand., 1930, 74: 284–323.
19. Idem. Acta chir. scand., 1931, 68: 551–573.
20. BARKER, L. F. J. Bone Surg., 1934, 16: 435–440.
21. BARKER, V. L., and BRINES, O. Arch. Surg., 1939, 39: 205–213.
22. BARR, D. P., BULGER, H. A., and DIXON, H. H. J. Am. M. Ass., 1929, 92: 951–952.
23. BAUER, J., and JUNG, A. Rev. chir., Par., 1937, 75: 284–295.
24. BAUMGARTNER, C. J. West. J. Surg., 1940, 48: 324–326.
25. BELLIN, D. E., and GERSCHWIN, B. S. Am. J. M. Sc., 1935, 190: 519–525.
26. BENJAMINS, C. E. Beitr. path. Anat., 1902, 31: 143–182.
27. BERGSTRAND, H. Acta chir. scand., 1941, 85: 25–40.
28. BERNER, D. Virchows Arch., 1931, 282: 680–702.
29. BEYERINCK, C. W. Ned. tschr. geneesk., 1932, 76: 3389–3391.
30. BICKEL, G. Helvet. med. acta, 1945, 12: 276–277.
31. BODANSKY, M., and DUFF, V. B. J. Am. M. Ass., 1939, 112: 223–229.
32. BOLLE, K. Ueber einen epithelkoerperchentumor bei ostitis fibrosa generalisata (Recklinghausen). Thesis, Koenigsburg, 1937.
33. BOYD, J. D., MILGRAM, J. E., and STEARNS, G. J. Am. M. Ass., 1929, 93: 684–688.
34. BRINDLE, H. R., and HERRMAN, W. G. Am. J. Roentg., 1930, 41: 601–602.
35. BROOKE, R. Proc. R. Soc. M., Lond., 1935, 28: 1366–1368.
36. BROWN, A. E. Proc. Mayo Clin., 1935, 10: 417–424.
37. BRUNNER, W. Arch. klin. Chir., 1937, 188: 330–352.
38. Ibid., 1940, 190: 429–438.
39. CAHILL, J. A. Med. Ann. District of Columbia, 1934, 3: 275–278.
40. CAMPBELL, I. L., and TURNER, C. W. Res. Bull. No. 352, 134 p. Univ. Missouri, Coll. Agr., Columbia, Missouri, 1942.
41. CARNOT, P., and LAFITTE, A. Bull. Soc. méd. Hôp. Paris, 1938, 3rd ser., 54: 426–436.
42. CARTER, E. P., BAKER, B. M., and HOWARD, J. E. Tr. Ass. Am. Physicians, 1936, 51: 215–219.
43. CASTLEMAN, B., and MALLORY, T. B. Am. J. Path., 1935, 11: 1–72.
44. CHAUVEAU, J. De l'osteite fibro-géodique type Recklinghausen. Thèse pour Le Doctorat en Médecine. Paris: Masson et Cie, 1925.
45. CHAPMAN, H. S. West. J. Surg., 1941, 49: 386–397.
46. CHIEVITZ, O., and OLSEN, H. C. Acta chir. scand., 1932, 71: 172–204.
47. CHOWN, B. Canad. M. Ass. J., 1937, 37: 16–18.
48. CHURCHILL, E. D. Ann. Surg., 1934, 100: 606–612.
49. Idem. Surgical Treatment of Parathyroid Tumors Associated with Hyperparathyroidism. In Pack, G. T., & Livingston, E. M., ed., "Treatment of Cancer." 1: 672-686. New York: Hoeber, 1940.
50. CHURCHILL, E. D., and COPE, O. Ann. Surg., 1936, 104: 9–35.
51. Idem. Surg. Gyn. Obst., 1934, 58: 255–271.
52. COBURN, D. E. Am. J. Surg., 1944, 66: 252–258.
53. COCHRANE, R. C. N. England J. M., 1941, 224: 973–978.
54. COHEN, H., and KELLY, R. E. Brit. J. Surg., 1933, 20: 472–478.
55. COHN, W. E., COHN, E. T., and AUB, J. C. Annual Rev. Biochem., 1942, 11: 415–440.
56. COLLIP, J. B. Medicine, Balt., 1926, 5: 1–57.
57. COMPERE, E. L. Surg. Gyn. Obst., 1930, 50: 783–794.
58. COOLEY, T. B. Am. J. Dis. Children, 1931, 42: 691–693.
59. COPE, O. Ann. Surg., 1941, 114: 706–733.
60. Idem. Surgery, 1944, 16: 273–288.
61. COPELLO, O., and BARLARO, P. M. Bol. Soc. cir. Buenos Aires, 1932, 16: 1007–1023.
62. CORYN, G. Presse méd., 1934, 1: 62–63.
63. COSIN, C. F. Guy's Hosp. Rep., Lond., 1931, 81: 297–318.
64. COUCH, J. H., and ROBERTSON, H. F. Surg. Gyn. Obst., 1941, 73: 165–174.
65. COURTY, L., and CALLENS, J. Bull. Soc. nat. Chir., Par., 1934, 60: 777–783.
66. CURTIS, C. S., and LOOMIS, E. G. N. England J. M., 1941, 225: 370–371.
67. CUTHBERTSON, D. P., and MACKEY, W. A. Glasgow M. J., 1935, 5: 249–292.
68. DAVIDSON, O. W. J. Urol., Balt., 1937, 37: 35–41.
69. DAWSON, J. W., and STRUTHERS, J. W. Edinburgh M. J., 1923, 30: 421–559.
70. DENK, W. Zbl. Chir., 1941, 68: 1794–1796.
71. DENNINGER, H. S. Arch. Path., 1931, 11: 939–947.
72. DE QUERVAIN, F. Deut. Zschr. Chir., 1909, 100: 334–352.
73. DE SANTI. Internat. Zbl. Laryng. Rhinol., 1900, 16: 546–547.
74. DINSMORE, R. S., and ZIDD, E. Cleveland Clin. Q., 1945, 12: 16–18.
75. DOWNS, R. S., and SCOTT, V. Arch. Int. M., 1941, 67: 658–664.
76. DRENNAN, A. M. J. Path. Bact., Lond., 1930, 33: 65–70.
77. DRESSER, R., and HAMPTON, A. O. Am. J. Roentg., 1931, 25: 739–748.
78. DYKE, S. C., WALKER, R. M., and FREEMAN, E. Lancet, Lond., 1933, 2: 530–532.
79. EGGERS. Cited by F. Mandl. Zbl. Chir., 1929, 56 1739–1745.
80. ELMSLIE, R. C., FRASER, F. R., DUNHILL, T. P., Vick, R. M., HARRIS, C. F., and DAUPHINEE, J. A. Brit. J. Surg., 1933, 20: 479–507.
81. ELSOM, K. A., WOOD, F. C., and RAVDIN, I. S. Am. J. M. Sc., 1936, 191: 49–55.
82. ERDHEIM, J. Beitr. path. Anat., 1903, 33: 158–236.
83. FAHRNI, G. S. Canad. M. Ass. J., 1937, 37: 11–16.
84. Idem. Tr. West. Surg. Ass., 1937, 47: 484–496.
85. Idem. Tr. Am. Ass., Study Goiter, 1940, 252–262.
86. FAWCETT, A. W. Brit. M. J., 1938, 1: 283.
87. FISCHER, B. Cited by Guenther, B. Frankf. Zschr. Path., 1922, 28: 294–318.

88. Flick, J. B., and Gibbon, J. H., Jr. Bull. Ayer Clin. Lab., 1937, 3: 73–78.
89. Flink, E. B. Med. Clin. N. America, 1945, 29: 389–404.
90. Foulds, G. S. J. Urol., Balt., 1944, 52: 180–183.
91. Fox, N., and Taglia, V. Arch. Otolar., Chic., 1943, 37: 377–390.
92. Franck, S., and Hjerrild, N. Hospitalstidende, 1937, 80: 1117–1130.
93. Friderischsen, C. Lancet, Lond., 1939, 1: 85–86; also Ugeskr. laeger, 1939, 101: 209–211.
94. Frugoni, C., and Alessandri, R. Policlinico, 1932, (sez. chir.) 39: 1765–1776.
95. Gamberini, C. Endocr. pat. cost., Bologna, 1935, 10: 547–557.
96. Gaudier, H., and Patoir, G. Bull. Soc. chir. Paris, 1932, 58: 1154–1157.
97. Gillette, N. W. Gillette Clin. Q., 1942–1943, 1: 16–19.
98. Giordano, A. Endocr. pat. cost., Bologna, 1939, 14: 125–152.
99. Gley, E. C. rend. Soc. biol., 1891, 43: 250.
100. Gold, E. Mitt. Grenzgeb. Med. Chir., 1928, 41: 63–82.
101. Goldman, D., and Sapadin, A. Ohio. M. J., 1944, 40: 437–439.
102. Goldman, L., and Smyth, F. S. Ann. Surg., 1936, 104: 971–981.
103. Gomziakov, G. A. Vest. Khir., 1937, 54: 109–110.
104. Gordon-Taylor, G., and Handley, R. S. Brit. J. Surg., 1937, 25: 6–16.
105. Gordon-Taylor, G., and Wiles, P. Brit. J. Surg., 1932, 19: 606–618.
106. Grasso, R. Policlinico, (sez. chir.), 1937, 44: 304–312.
107. Greenberg, D. M. Annual Rev. Biochem., 1939, 8: 269–300.
108. Grollman, A., and Morehead, R. P. North Carolina M. J., 1943, 4: 524–526.
109. Guest, G. M., and Rapoport, S. Physiol. Rev., 1941, 21: 410–437.
110. Gutman, A. B., and Parson, W. B. Ann. Int. M., 1938, 12: 13–31.
111. Gutman, A. B., Swenson, P. C., and Parsons, W. B. J. Am. M. Ass., 1934, 103: 87–94.
112. Hand, J. R. Surg. Clin. N. America, 1933, 13: 1365–1378.
113. Handron, C. J. N. York State J. M., 1938, 38: 1449–1453.
114. Hanes, F. M. Internat. Clin., 1936, 4: 80–85.
115. Idem. Am. J. M. Sc., 1939, 197: 85–90.
116. Idem. North Carolina M. J., 1945, 6: 507–515.
117. Hanke, H. Arch. klin. Chir., 1932, 172: 366–402.
118. Harbitz, F. J. Med. Res., 1915, 27: 361–375.
119. Hart, D., and Gardner, C. E., Jr. South. Surgeon, 1940, 9: 41–58.
120. Hartwich, A. Virchows Arch., 1922, 236: 61–116.
121. Hayes, J. M. Minnesota M., 1938, 21: 74–76.
122. Hecker. Zbl. Chir., 1930, 57: 2804.
123. Hellström, J. Acta chir. scand. 1932, 69: 237–304.
124. Hermeto Júnior, S. Rev. cir. S. Paulo, 1942–1943, 8: 217–246.
125. Hirsch, H. Am. J. Roentg., 1937, 38: 457–464.
126. Honner, R. S., Harris, R. G. S., and Herlihy, J. D. Med. J. Australia, 1943, 1: 221.
127. Hughes, J. F. Med. J. Australia, 1939, 2: 830–835.
128. Hulst, J. P. L. Zbl. allg. Path., 1905, 16: 103–105.
129. Hunter, D. Proc. R. Soc. M., Lond., 1929, 23: 227–234.
130. Idem. Med. Press, 1940, 204: 432–435.
131. Hunter, D., and Turnbull, H. M. Brit. J. Surg., 1931, 19: 203–284.
132. Husslein, J. Beitr. klin. Chir., 1939, 169: 276–298.
133. Jaffe, H. L. Arch. Path., 1933, 16: 63, 236.
134. Jessop, W. J. E. Irish J. M. Sc., 1936, 6th ser., pp. 59–91.
135. Jobe, M. C. Rocky Moutain M. J., 1941, 38: 121–126.
136. Johnson, J. W., Jr. Am. J. Path., 1939, 15: 111–126.
137. Keynes, G., and Taylor, H. Brit. J. Surg., 1933, 21: 20–28.
138. Khurgina, P. A. Klin. med., Moskva, 1933, 11: 1238–1243.
139. Kleinberg, S. Am. J. Surg., 1940, 50: 358–362.
140. Klendshoj, N. C., and Koepf, G. F. J. Clin. Endocr. 1943, 3: 351–352.
141. Kocher, T. Virchows Arch., 1899, 115: 532–556.
142. Lage, R., and Greene, J. A. J. Clin. Endocr., 1943, 3: 408–412.
143. Lahey, F. H., and Haggart, G. E. Surg. Gyn. Obst., 1935, 60: 1033–1051.
144. Langhans, T. Virchows Arch., 1907, 189: 69–152.
145. Léri, A., Layani, F., Lièvre, J. A., and Weill, J. Bull. Soc. méd. hôp. Paris, 1930, 54; 1881–1891.
146. Lewis, D., and Trimble, I. R. Deut. Zschr. Chir., 1934, 242: 315–320.
147. Lièvre, J. A., and Muller, P. Bull. Soc. méd. hôp. Paris, 1931, 47: 1515–1522.
148. Logan, M. A. Physiol. Rev., 1940, 20: 522–560.
149. MacCallum, W. G. Bull. Johns Hopkins Hosp., 1905, 16: 87–89.
150. McClure, R. D. Arch. Surg., 1936, 33: 808–824.
151. McClure, R. D., and Lam, C. R. Ann. Surg., 1945, 121: 454–469.
152. McDonald, C. C. Texas J. M., 1946, 41: 468–471.
153. MacKenzie, K. Austral. N. Zealand J. Surg., 1938, 7: 256–259.
154. MacLean, F. C. J. Am. M. Ass., 1941, 117: 609–619.
155. Idem. Annual Rev. Physiol., 1943, 5: 79–104.
156. Idem. In Evans, E. A., Jr., ed. The Biological Action of Vitamins. Chicago: Univ. of Chicago Press, 1942, pp. 185–201.
157. McMahon, A. Tr. Am. Ther. Soc., 1934, 34: 176–192.
158. McQuillan, A. S. Ann. Surg., 1938, 108: 464–468.
159. Mallory, T. B. N. England J. M., 1941, 225: 196–201.
160. Ibid., 1946, 234: 125–127.
161. Mandl, F. Wein. klin. Wschr., 1925, 38: 1343–1344.
162. Idem. Deut. Zschr. Chir., 1933, 240: 362–375.
163. Maresch, R. Frankf. Zschr. Path., 1916, 19: 159–171.
164. Mathers, R. P., and Cappell, D. F. J. Lar. Otol., Lond., 1938, 53: 656–667.
165. May, E., and Lièvre, J. A. Bull. Soc. méd. hôp. Paris, 1931, 47: 1808–1819.
166. Mayer, S., Jr. Bull. Johns Hopkins Hosp., 1941, 68: 319–328.
167. Meisel, M. Frankf. Zschr. Path., 1937, 51: 104–130.
168. Mellgren, J. Acta path. microb. scand., 1943, 20: 693–734.
169. Idem. Upsala läk. fören. förh., 1936, 42: 35–46.
170. Mertz, A. A. Illinois M. J., 1932, 62: 468–472.
171. Meyer, O. Frankf. Zschr. Path., 1917, 20: 115–159.
172. Miller, E. S., and Evans, L. R. N. England J. M., 1942, 227: 949–952.
173. Mimpriss, T. W., and Butler, R. W. Brit. J. Surg. 1934, 21: 500–506.
174. Moehlig, R. C., and Ulch, H. W. Am. J. Surg., 1946, 71: 381–386.

175. Idem. Harper Hosp. Bull., Detr., 1944, 2: 41–49.
176. Molineus. Arch. klin. Chir., 1913, 101: 333–368.
177. Möller, W. Acta chir. scand., 1936, 78: 182–204.
178. Moolton, S. E., Clarke, F. M., and Haywood, H. J. Am. M. Ass., 1937, 108: 111–112.
179. Moore, T. D. Memphis M. J., 1936, 11: 37–38.
180. Morelle, J. J. chir. ann. Soc. belge chir., 1932, 31: 29, 381–397.
181. Ibid. 1934 33: 31, 178–188.
182. Morton, J. J. Internat. Clin., 1933 3: 18–26.
183. Moulonguet, P., and Lièvre, J. A. Bull. Soc. med. hôp. Paris, 1938, 54: 764–766.
184. Idem. J. chir., Par., 1939, 53: 161–175.
185. Mozer, J. J., and Party, R. Rev. méd. Suisse rom., 1940, 60: 1213–1223.
186. Naegelsbach and Westhues. Deut. med. Wschr., 1922, 48: 1599.
187. Neves, C., and Pereira Caldas, J. Lisboa med., 1936, 13: 423–446.
188. Nickels, J. Arch. klin. Chir., 1944, 205: 488–495.
189. Noad, K. B., and Miller, I. D. Austral. N. Zealand J. Surg., 1940, 10: 198–204.
190. Noble, J. F. and Borg, J. F. Arch. Int. M., 1936, 58: 846–859.
191. Noble, T. P. J. Bone Surg., 1932, 14: 181–185.
192. Noehren, A. H., and Eckhert, K. N. York State J. Med., 1938, 38: 856–858.
193. Norris, E. H. Anat. Record, 1947. In press.
194. Idem. Arch. Path., 1946. 42: 261–273.
195. Idem. Washington Pub. No. 479. Contr. Embryol. Carnegie Inst., 1937, 26: 247–294.
196. Ibid. Pub. No. 496. 1938, 27: 191–207.
197. O'Connor, V. J., and Kearns, J. J. Arch. Path., Chic., 1940, 30: 827.
198. Oliver, W. A. Lancet, Lond., 1939, 2: 240–244.
199. Oppenheimer, B. A. J. Mount Sinai Hosp. N. York, 1940–1941, 7: 217–219.
200. Orr, I. M. Brit. J. Surg., 1942–1943, 30: 375–377.
201. Paltauf, R. Zbl. allg. Path., 1913, 24: 959–961.
202. Parreira, H., and Casto Freire, L. C. rend. Soc. biol., 1926, 95: 1590–1592.
203. Patterson, D. C. Proc. Connecticut M. Soc., 1934, 142: 214–215.
204. Payne, R. Proc. R. Soc. M., Lond., 1936, 29: 1128–1130.
205. Pemberton, J. de J., and Geddie, K. B. Ann. Surg., 1930, 92: 202–211.
206. Penecke, R. Zbl. allg. Path., 1926, 37: 535.
207. Petersma, J. P. Ned. tschr. Geneesk., 1937, 81: 2225–2231.
208. Pope, A., and Aub, J. C. N. England J. M., 1944, 230: 698–707.
209. Quick, A. J., and Hunsberger, A., Jr. J. Am. M. Ass., 1931, 96: 745–751.
210. Quick, A. J., Hunsberger, A., Eliason, E. L., and Hudson, H. J. Am. M. Ass., 1935, 104: 2248–2249.
211. Rahm, H. Zbl. Chir., 1938, 65: 2027–2038.
212. Rankin, F. W., and Priestley, J. T. Am. J. Surg., 1933, 20: 298–314.
213. Ravina, A., and Lyon, S. Presse méd., 1934, 1: 1022–1024.
214. Redwitz, E. von. Zbl. f. Chir., 1931, 58: 2410.
215. Renaud, M., Petit-Marie, G., and Fayot, M. Bull. Soc. méd. hôp. Paris, 1932, 48: 1107–1110.
216. Rice, C. O. Minnesota M., 1943, 26: 1092.
217. Riven, S. S., and Mason, M. F. Ann. Int. M., 1936, 9: 1578–1587.
218. Robinson, W. L. Bull. Acad. M., Toronto, 1940–1941, 14: 10–12.
219. Rogers, H. M. J. Am. M. Ass., 1946, 130: 22–28.
220. Rosedale, R. S. Am. J. Path., 1932, 8: 745–751.
221. Rosenbach and Disque. Verh. Ges. Verdauungskr., 1930, 10: 223–224.
222. Ross, K. Austral. N. Zealand J. Surg., 1935, 4: 407–413.
223. Royde, C. A. Brit. J. Surg., 1942, 30: 160–175.
224. Rusakov, A., and Sakayan, R. G. Sovet. klin., 1932, 18: 212–228.
225. Rutishauser, E. Schweiz. med. Wschr., 1941, 71: 189.
226. Idem. Virchows Arch., 1935, 294: 570–586.
227. Sainton, P., and Millot, J. L. Ann. anat. path., Par., 1933, 10: 813–818.
228. Sandstrom, I. Upsala Läk. Fören. Förh., 1880, 15: 441–470.
229. Sauer, H. Deutsche Zschr. Chir., 1922, 170: 95–149.
230. Schlagenhaufer. Muench. med. Wschr., 1916, 63: 56.
231. Schlesinger, H., and Gold, E. Klin. Wschr., 1933, 12: 784–787.
232. Schmidt, C. L. A., and Greenberg, D. M. Physiol. Rev., 1935, 15: 297–434.
233. Schmorl. Muench. med. Wschr., 1907, 54: 494–497.
234. Schouten, D. E. Ned. tschr. Geneesk., 1931, 72: 252–255.
235. Schrumpf, A. Acta med. scand., 1943, 115: 199–218.
236. Schrumpf, A., and Harbitz, H. F. Acta chir. scand., 1937, 80: 199–208.
237. Schupp, H. Deut. Zschr. Chir., 1931, 233: 195–238.
238. Schwensen, C., and Eiken, T. Ugeskr. laeger, 1933, 95: 1259–1264.
239. Sharpe, H. S. Canad. M. Ass. J., 1939, 40: 164–165.
240. Shofner, N. S., Barksdale, E. H., and Regen, E. M. J. Tennessee M. Ass., 1943, 36: 97–110.
241. Silberberg, M., and Silberberg, R. Arch. Path., Chic., 1943, 36: 512–534.
242. Siris, I. E. N. York State J. M., 1940, 40: 1788–1795.
243. Sisk, J. N. Wisconsin M. J., 1936, 35: 41.
244. Smith, F. B., and Cooke, R. T. Lancet, Lond., 1940, 2: 650–651.
245. Snapper, I. Arch. Int. M., 1930, 46: 506–523.
246. Idem. Acta med. scand., 1940, 103: 321–340.
247. Snapper, I., and Boevé, H. J. Deut. Arch. klin. Med., 1931, 170: 371–386.
248. Snell, A. M. Proc. Mayo Clin., 1936, 11: 633–636.
249. Soffer, L. J., and Cohn, C. Arch. Int. M., 1943, 71: 630–649.
250. Sorensen, A. Acta chir. scand., 1934, 74: 485–490.
251. Sprunt, T. P. Ann. Int. M., 1938, 12: 121, 127.
252. Stenholm, T. Pathologisch-anatomische Studien ueber die Osteodystrophia fibrosa (sogennanten Ostitis fibrosa von Recklinghausen). Upsala: Almquist and Wiksells, 1924.
253. Strandgaard, H. Hospitalstidende, 1934, 77: 383–393.
254. Strauch, B. Frankf. Zschr. Path., 1922, 28: 318–334.
255. Struthers, J. W. Tr. Med. Chir. Soc. Edinburgh, 1932–33, 112 sess., 37–44.
256. Thomason, G., and Smith, L. West. J. Surg., 1933, 41: 78–82.
257. Thomson, D. L., and Collip, J. B. Physiol. Rev., 1932, 12: 309–383.
258. Threatte, B., Jenkins, W. F., and Hewett, R. J. M. Ass. Georgia, 1941, 30: 223–227.
259. Tileston, W. Proc. Connecticut M. Soc., 1934, 142: 197–220.
260. Valls, J., Ottolenghi, C. E., and Gonzalez, J. C. L. Rev. ortop. traumat., B. Air., 1935, 5: 91–132.
261. Vance, J., Rogde, J., and Breck, L. W. South. M. J., 1940, 33: 128–135.

262. VENABLES, J. F. Guy's Hosp. Rep., Lond., 1933, 83: 184–199.
263. VEREBÉLY, T. VON. Virchows Arch., 1907, 187: 80–105.
264. VOGT, F. Zbl. Chir., 1941, 68: 890–892.
265. VOLTZ, C. P., and SMULL, K. Ann. Int. M., 1944, 21: 329–332.
266. VUORI, A. Duodecim, 1946, 62: 66–75.
267. WANKE, R. Deutsche Zschr. Chir., 1930, 228: 210–233.
268. WARREN, S., and MORGAN, J. R. E. Arch. Path., 1935, 20: 823–836.
269. WASHBURN, W. W. California M., 1938, 48: 240–244.
270. WEBB, R. C. Minnesota M., 1935, 18: 664–669.
271. WEICHSELBAUM, A. Verh. deut. path. Ges., 1906, 10: 83–85.
272. WEIL, M. P., LANGLOIS, L., and DRAGOMIRESCO, M. Bull. Soc. méd. hôp. Paris, 1931, 47: 1929–1937.
273. Welsh, D. A. J. Anat. Physiol., 1898, 32: 292–307.
274. WENTWORTH, E. T., and LINGEMAN, L. R. Radiology, 1936, 27: 365–367.
275. WERNER, A. A. South. M. J., 1942, 35: 671–676.
276. WHYTE, D. N. Zealand M. J., 1939, 38: 394–397.
277. WICHMANN, F. W. Deutsche Zschr. Chir., 1932, 235: 619–634.
278. WILDER, R. M. Endocrinology, 1929, 13: 231–244.
279. WILDER, R. M., CAMP, J. D., ROBERTSON, H. E., and ADAMS, M. Proc. Staff meeting, Mayo Clin., 1932, 7: 597–606.
280. WILDER, R. M., and HOWELL, L. P. J. Am. M. Ass., 1936, 106: 427–431.
281. WINDHOLZ, F. Radiology, 1945, 44: 14–22.
282. WOODSIDE, M. A., and FOULDS, G. S. Ontario M. Rev., 1944, 11: 93–96.
283. ZAJEWLOSCHIN, M. N. Frankf. Zschr. Path., 1930 40: 132–138.

# ABSTRACTS OF CURRENT LITERATURE

## SURGERY OF THE HEAD AND NECK

### HEAD

**Bazzoli, L.: The Pathology and Clinical Symptoms of the Tumors of the Salivary Glands** (Patologia e clinica dei tumori delle ghiandole salivari). *Arch. ital. chir.*, 1945, 67: 3.

In this monograph the author reviews the gross and microscopic pathology of tumors of the salivary glands, various theories of their origin, their classification, clinical symptoms, and therapy.

His own material consists of 43 cases, 34 benign and 9 malignant. After extirpation of 1 benign tumor the resulting fistula promptly healed following roentgen treatment. The remaining cases of benign tumors terminated in uneventful recovery.

The author believes that preoperative roentgen irradiation, improved surgical technique, and the postoperative application of large doses of x-rays greatly improved the prognosis of malignant tumors of the salivary glands. Surgical treatment occupies the main place in our armamentarium for the treatment of malignant tumors of the salivary glands.

JOSEPH K. NARAT, M.D.

**Pricolo, V.: Bilateral Mixed Tumors of the Submaxillary Gland** (Tumore misto bilaterale della ghiandola sottomascellare). *Tumori*, Milano, 1946, 32: 32.

A man of 74 who had no family and no previous history of any importance reported that 2 months before coming to the clinic a swelling had appeared in the left maxillary region and a few days later the right submaxillary region began to swell also. The tumors increased in size until on admission the one on the left was the size of a large pear and the one on the right was considerably smaller—about the size of a pigeon's egg. The patient was in moderately good general condition.

Operation was performed in October, 1944. Both tumors were encapsulated but the left one was so intimately adherent to the anterior belly of the digastric muscle that a part of the muscle had to be removed. The patient was discharged November 23, 1944, after he had been given roentgen treatment.

The tumors did not show any remnants of the salivary glands. The neighboring lymph glands were not enlarged. The histological findings in the 2 tumors were the same. The tumor cells were massed together in the lower part and in the upper part they were connected, forming cords, which passed into an intercellular mucous tissue, and gave the typical picture of mixed salivary gland tumor.

The different theories that have been advanced to explain the origin of these tumors are discussed. The author himself believes that the theory of inclusion of epitheliomesenchymal rests in the glands during embryonic life and their later development under the action of some unknown stimulus is the correct one. It is the only one that explains the bilaterality of the tumors, the fact that they developed at the same time on both sides, and the identical histological picture on the two sides. AUDREY G. MORGAN, M.D.

### EYE

**Gundersen, T.: Observations on the Vossius Ring.** *Am. J. Ophth.*, 1946, 29: 837.

Vossius who first described this ring in 1903 identified two forms—a colored one which he considered to be derived from the pars cilliaris iridis, and a rarer colorless one which he attributed to degenerative changes in the epithelium of the lens capsule and possibly in the anterior cortical layers of the lens.

In 1918 Hesse and Vogt showed that the ring was not an opacity in the lens or lens capsule but a thin ring of deposit on the former.

Severe trauma and intraocular hemorrhage are the most constant factors in the etiology of the Vossius ring. Hesse believes that hemorrhage is more important than trauma. Intraocular hemorrhage in one or more of these—retina, vitreous, or aqueous—was present in all 19 cases of this series. Senile and presenile eyes seem to be immune to the formation of a Vossius ring. Gundersen states that the existence of a nontraumatic Vossius ring has never been proved.

All cases in this series occurred in American soldiers between the ages of 19 and 30 years as a result of battle injury. Intraocular hemorrhage was found in every eye; extensive vitreous or retinal hemorrhage was absent in only 4 cases. The size of the ring was constant in all cases—between 2.25 and 2.75 mm. in diameter.

Gundersen concludes that the ring does not consist of iris pigment left behind on the lens capsule as a result of an injury but that during the interchange of fluids through the anterior lens capsule, blood pigments from the aqueous are deposited in characteristic fashion. JOSHUA ZUCKERMAN, M.D.

**Vail, D.: The Scleral Resection (Eyeball Shortening) Operation.** *Am. J. Ophth.*, 1946, 29: 785.

The author discusses scleral resection, or the eyeball shortening operation. This procedure was introduced in 1903 by Mueller for the treatment of retinal detachment in myopia. He resected an oval piece of sclera from 8 to 10 mm. in width and from 18 to 20 mm. long from the temporal side of the eyeball.

One hundred and twenty-one cases of scleral resection for detachment have been collected from the

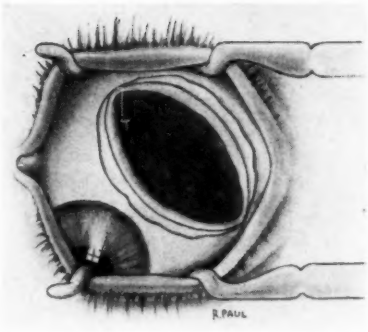


Fig. 1. (Vail). The scleral resection operation. Diagrammatic appearance and position of the staphyloma.

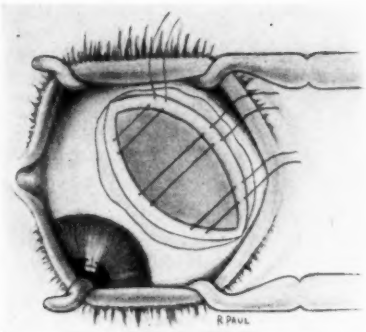


Fig. 3. (Vail). Diagrammatic drawing of position of sutures.

literature, 25 of the retinas being successfully reattached and 31 being partially or temporarily reattached. In other words, cures were obtained in about 20 per cent of the cases, which is remarkably good. Lindner modified Mueller's technique in 1933. He operated 23 times on 12 eyes, most of which were myopic. The best results were obtained in detachment in aphakic eyes and in those cases in which a piece of sclera from the entire circumference of the eyeball was removed in 2 stages.

Vail performed a scleral resection on an only eye which was aphakic and on which 2 previous diathermy operations had been unsuccessful. The retina was reattached and vision restored to 20/70. A scleral resection was done 3 times on the only eye of a young man who had a complete detachment but no real improvement followed.

The author reports a case of Pischel's in which determination brought about a cure. A young man 30 years of age had undergone needling of congenital cataracts innumerable times. One eye was finally lost. For a retinal detachment in the aphakic eye, first a Lindner undermining operation and then a diathermy coagulation were performed. At a third operation an unexpected perforation occurred. Finally, at the fourth operation, eyeball shortening operation of the whole lower half of the eyeball was done; a 3 mm. wide crescent was removed, and this was followed by diathermy coagulation. This yielded 6/200 vision and a normal visual field which still prevails 4 years later.

It is concluded that scleral resection is feasible and offers some hope of success in detachment of the retina; it is less hazardous than removal of a clear lens in cases of high myopia.

The operation is also useful for anterior (intercalary) staphyloma and equatorial staphyloma of the sclera. The author cured a case of the latter associated with retinal detachment by excision in a manner similar to the eyeball shortening operation described by Lindner (Fig. 1). The staphyloma measured 12 by 15 mm. and began 6 or 7 mm. from the limbus between the tendons of the superior and lateral recti muscles. Two double armed sutures were inserted

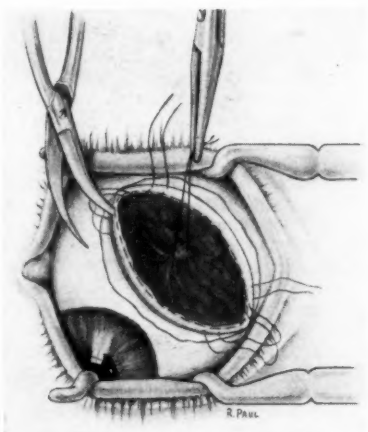


Fig. 2. (Vail). Showing the value of the fixation.

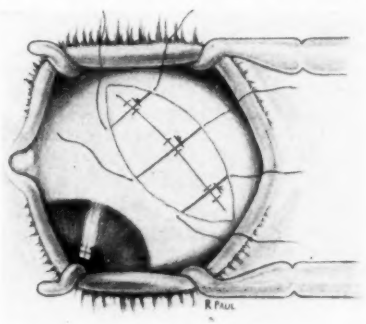


Fig. 4. (Vail). Showing closure of the wounds.

along the edges of the staphyloma (Fig. 2) and looped out of the way. A fixation suture was inserted in the center of the ectasia. An incision was made along the upper and inferior edges, and the excision was completed with curved scissors (Fig. 3). Subretinal fluid and presumably fluid vitreous were lost, but the main vitreous body could be seen glistening clearly like water in a well. Both sutures were tied, a third being placed between them (Fig. 4). The retina was reattached 3 years later and the vision was 20/40+ and J2. No recurrence of the staphyloma had developed after 9 years. The author recommends excision of staphylomas before retinal detachment occurs.

Vail concludes that scleral excision has been performed a sufficient number of times to indicate its value in selected instances. Moreover, it is worthy of further speculative study in the removal of melanoma of the choroid in an only eye, an area of severe episcleritis, an inflammatory nodule, or a malignant lesion in the sclera in scleromalacia perforans.

JOSHUA ZUCKERMAN, M.D.

**Stallard, H. B.: Retinal Detachment due to War Trauma.** *Brit. J. Ophth.*, 1946, 30: 419.

The author points out that it is rare to find retinal detachment due to war missiles in which the eye is left reasonably intact. After injury by a missile the eye ball is usually collapsed or presents a large penetrating wound or disorganization which generally makes excision necessary.

If a tear or split is absent in blast injuries expectant treatment is justifiable. The visual results obtained by expectant treatment after reposition of the detachment at the macula are good if they are unassociated with retinal tear, pathological lesion at the macula, or operative treatment.

Of a series of 20 cases, 1 was too hopeless to benefit by operation, but 2 patients recovered spontaneously; of the 17 cases which were operated on 11 presented successful results with complete replacement and 6 presented failures. In 3 of the 6 failures, the results appeared at first to be successful, but later the condition recurred. Vision and the visual field improved after operation in 7 of the cases.

The results of operative treatment in cases of military trauma compared unfavorably with those in other types of detachment mainly due to severe contusion from war missiles, very low intra-ocular pressure, organizing vitreous hemorrhage and sheets of blood on the retina and between it and the choroid.

JOSHUA ZUCKERMAN, M.D.

## EAR

**Lederer, F. L., and Hardy, W. G.: Treatment and Training of the Hard of Hearing. A Program of Physical and Psychosocial Therapy.** *Arch. Otolar.*, Chic., 1946, 43: 429.

In a little over a year and a half, 3,000 patients who suffered incapacitating hearing loss were given the benefits of a complete physicopsychosocial reconditioning, reorientation, and readjustment. Any person in the Navy, Marine Corps, or Coast Guard having a loss of 30 decibels or more in the conversational range in the better ear was admissible to aural rehabilitation. The army had a similar program.

Of the cases coming under the authors' care, 40 per cent existed prior to enlistment or induction and 60 per cent were in patients connected with the service, the majority of the former having suffered aggravation by service experiences. Acoustic trauma, mainly due to heavy fire, was responsible for most hearing losses, and the remainder were due to the usual etiological factors. The authors' experience evidences the fact that ears which have had previous inflammatory disease are most vulnerable to the assaults in military service.

The Navy's approach to aural rehabilitation was crystalized by its centralization in the individual's personality—its goal being the restitution of the total person and its basis, that "the man is more than his ears." He has need for some positive means to arrest any deteriorating processes which would prevent him from living a complete, full, economically and socially sufficient life in a competitive world. This is important in a society which places a premium on the communicative process. He requires new abilities and skills in the form of education in speech (lip) reading, auditory training, and the use of a hearing aid; he needs also to acquire an insight which will nullify the adverse effects of deafness and discourage tendencies toward depression and hypersubjectivity.

To foster these aims and ideals, the Navy assembled a group of specialists in speech and hearing rehabilitation. These men and women provided a co-ordinated therapeutic relationship comprising otologists, psychologists, speech reading teachers, speech correctionists, instructors in auditory training, specialists in audiometry and acoustics, prosthetic technicians, and a collateral group represented by prevocational counsellors, occupational therapists, educational advisors, physical training instructors, and medicosocial workers. The majority of these specialists were chosen from civil life for their pre-eminence in their fields and others were trained as part of an in-service program and at Hunter College by a Navy-staffed faculty.

On admission to the program, each patient received thorough physical and clinical examinations, and all indicated medical and surgical measures were taken. Once the data on each individual were assembled and made available to the staff, the rehabilitee was assigned to classes. Two basic training courses were required—speech (lip) reading, and auditory training—and, except for the obvious requirement of individual cases, the Navy's methods were built around group participation. The work in speech reading was formulated upon the fundamental skills necessary to utilize visual and muscular cues for linguistic communication, as supplements to residual hearing. The work in auditory training entails the re-education of residual hearing with the

use of a hearing aid, the use of the aid in life situations with background noises, the teaching of the fundamentals of the hearing function, and a discussion of pertinent psychosocial problems.

Accordingly, the key processes in aural rehabilitation are: (1) accurate measurement of hearing loss and the suitable fitting of the most appropriate hearing aid; (2) training of residual hearing; (3) the development of skills in recognizing visual and kinesthetic cues to aid the communicative process; and (4) the rehabilitee's understanding of his own auditory function. Further clinical work includes speech training as a guard against the deterioration in speech habits that so frequently accompanies hearing loss, and whatever special corrective work is indicated for individual cases.

The medicosocial workers provided by the Red Cross furnished patients with the necessary orientation to the hospital situation; they supervised social and recreational activities, and provided help and counsel in a diversified range of familial problems. The prevocational counsellor helped the rehabilitee to determine an appropriate future and furnished contacts for a program of work therapy. The psychologist acted as a technical and personal father-confessor, relating problems of adjustment to hearing loss and acquainting the patient with the details of the retraining process.

In short, the therapy employed in this clinical service to the hard-of-hearing is an amalgum of the best medical and nonmedical practice that can be provided. The central task of aural rehabilitation is necessarily psychosocial, and the variable aspects of the program serve cumulatively to build up a pattern of successful performance for the individual.

## NOSE AND SINUSES

**Heatly, C. A.: Adamantinoma of the Maxillary Sinus with a Report of Cases.** *Ann. Otol. Rhinol.*, 1946, 55: 322.

An epithelial tumor arising from the odontogenic apparatus or from cells with a potentiality for forming tissues of the enamel organ is called an adamantinoma. An adamantinoma involving the maxillary sinus should be treated as a potentially malignant tumor in view of its established tendency toward recurrence if incompletely removed. The likelihood of recurrence will be lessened by the removal of the bony antral walls when possible, as well as by the meticulous use of the coagulating current. The early detection of recurrence will be aided not only by the creation of a large antral window but also by maintaining the opening in the canine fossa for a long period.

The value of postoperative irradiation is distinctly limited in view of the radioresistant nature of this tumor. The necessity for frequent re-examination of the patients for many years must be emphasized. The rate of recurrence is characteristically slow and malignant changes occasionally occur.

NOAH D. FABRICANT, M.D.

## NECK

**Borgström, S.: Paraxanthine Treatment of Hyperthyroidism.** *Acta chir. scand.*, 1946, 94: 137.

The treatment of hyperthyroidism with thiourea, thiouracil, and methylthiouracil has attracted great attention. In 1943 Carter and his collaborators published their experiences with another substance of antithyroid effect, paraxanthine. It has been found that the antithyroxine effect of paraxanthine was optimal at certain concentrations; if this limit was exceeded the inhibitory effect decreased, and ceased completely when the paraxanthine concentration rose to double the optimum.

This report is based on 9 clinical cases of hyperthyroidism treated with paraxanthine. As was to be expected, there was considerable difficulty in determining the optimum dose in the individual case, and the treatment with paraxanthine alone could be carried out in only 5 of the 9 cases. However, the excellent results in the 5 cases show conclusively that paraxanthine has an antithyroid effect in man. The usual dose was ½mgm. of paraxanthine 3 times a day.

In 4 of the cases paraxanthine was the sole agent used in the preoperative preparation of the patients. The response was satisfactory and the patients had an unusually smooth convalescence. In the fifth case paraxanthine had been the only drug given over a period of 6 months and the patient remained completely asymptomatic.

Paraxanthine did not give rise to any complications. F. J. LESEMANN, JR., M.D.

# SURGERY OF THE NERVOUS SYSTEM

## BRAIN AND ITS COVERINGS; CRANIAL NERVES

**Lofstrom, J. E., Webster, J. E., and Schneider, R. C.: The Early Pneumoencephalographic Findings following Penetrating Wounds of the Brain.** *Radiology*, 1946, 47: 1.

In a group of 256 patients with penetrating wounds of the head treated at the 36th General Hospital, 23 pneumoencephalographic studies were performed and comprise the basis of this report. A qualitative estimate of the amount of cerebral tissue lost and the size of the calvarial defect was made and correlated with the ventricular size. Although a quantitative correlation could not be found, it was noted that ipsilateral ventricular dilatation occurred with loss of cerebral tissue, and that the dilatation was usually greater in cases with extensive brain loss. In cases in which there was a large amount of brain loss, there was also a dilatation of the contralateral ventricle. An interesting finding was a completely normal ventricular conformation in a case with considerable loss of cerebral tissue.

No correlation could be found—at least in the early period—between ventricular distortions and the size of the bony defect. Also it was noted that closure of the dura was apparently not an important factor.

It is postulated that the mechanism of the ventricular dilatation in these cases is on the basis of hydrodynamic compensation. As the cerebral swelling subsides, the ventricles dilate as a result of the positive pressure of the cerebrospinal fluid. Although cerebral atrophy, cicatrix, and arachnoid abnormality may result in the progression of ventricular dilation, the former factors could not play an important part in these early changes during the first few months. Acute and chronic basilar meningitis with a partial block may likewise play a part in subsequent diffuse ventricular enlargement.

JACK I. WOOLF, M.D.

## SPINAL CORD AND ITS COVERINGS

**Pais, C.: Medullary Compression by Neurinomas in the Course of Recklinghausen's Disease** (Compressioni midollari da neurinomi nel morbo di Recklinghausen). *Arch. ital. chir.*, 1945, 67: 175.

Two cases in which Recklinghausen's disease involved the spinal cord are reported by the author. In the first case a paraplegic condition and in the second a preparaplegic condition were the results of the invasion of the spinal cord. The diagnosis was confirmed in both cases by biopsy.

If the sensory and motor syndromes in the course of Recklinghausen's disease cannot be explained by the presence of peripheral neurofibromas, a suspicion of the invasion of the spinal cord is justified and myelographic studies are indicated. The results of such studies may be negative in the presence of a radicular syndrome, for which paravertebral neurinomas are responsible. JOSEPH K. NARAT, M.D.

## PERIPHERAL NERVES

**White, J. C.: Painful Injuries of the Nerves and Their Surgical Treatment.** *Am. J. Surg.*, 1946, 72: 468.

This article considers many of the factors involved in nerve injuries. It reviews old, tried, and unsatisfactory procedures used for such injuries, and presents new techniques in order to crystallize a concept of treatment for the future. Underlying pathological factors leading to painful injuries of the nerves, such as faulty regeneration, sepsis, and scar formation, are noted, while the theories relating to the etiology of burning pain are discussed in detail. Various types of pain including painful neuromas, causalgia, and phantom limb are discussed with regard to their etiology and the factors having a direct influence on them.

The author wishes to stress several important general facts in the treatment of the aforementioned conditions. When pain is permitted to become chronic the cerebral cortex may become so involved in its projection that no peripheral operative procedure is of value. Likewise, it is particularly important in these cases to bear in mind that any ill-advised operation will only make the patient worse. A gradual accumulation of experience since World War I has shown that the following procedures are of no value: (1) repeated resections of neuromas, (2) neurectomies or interruptions of the nerve trunks at higher levels, (3) reamputations for the relief of pain (unless the stump is poorly constructed mechanically), (4) periarterial sympathectomy, (5) intrathecal injection of alcohol, and (6) posterior rhizotomy.

In their stead two simple procedures are advocated, namely, single resection of a painful neuroma, or regional sympathectomy. In the former it is suggested that the fresh nerve stump might be treated more effectively by injecting 20 per cent formalin or 1 per cent aqueous solution of gentian violet instead of alcohol. Boldrey's suggestion of drawing the nerve end through a drill hole of a neighboring bone is presented, as well as Spurling's technique of covering the end of the nerve, from which the neuroma has been resected, with a snugly fitting cuff of sheet tantalum. All of these are simple procedures and are theoretically sound methods which deserve careful trial, but as yet the follow-up time has been too short to give an evaluation of the results.

The second operation which is discussed is regional sympathectomy, either by repeated chemical blocking or by surgery. When pain is relieved during a

period of procaine block but reappears on the absorption of the drug, there is a good chance that surgical sympathectomy will bring about lasting results. If there is severe pain in an injured nerve it is much better to perform this procedure, after a successful procaine block, and postpone any necessary local repair until later. There is a better than even chance that the pain will be relieved and any abnormal peripheral circulation and sweating will be corrected. It is noted that occasionally the distress of painful phantom symptoms can be relieved by sympathectomy but the phantom symptom itself remains.

If these relatively simple procedures are unsuccessful the case should be reviewed by a psychiatrist before resort is made to the more mutilating operations on the central nervous system. Interruption of the lateral spinothalamic tract can relieve pain in a stump, but there is some doubt as to whether the marked phantom phenomenon can be alleviated by this procedure. No relief can be expected if the pain is indelibly stamped in the cortex. As a test, it appears that spinal anesthesia offers the best chance of ruling out pain of central origin after injury to the lower extremity, while procaine block can accomplish the same in the case of arm pain.

If pain is definitely of central origin associated with phantom symptoms, extirpation of the postcentral convolution may be attempted. Or, as the procedure of final choice, a frontal leucotomy may be performed for elimination of the patient's introspection developed as a result of prolonged intractable pain. Both of the latter operations are still purely experimental, and prolonged research is necessary prior to an accurate assessment of their value.

The author presents 27 service cases from the United States Naval Hospitals at Chelsea and St. Albans, and 13 civilian cases from the Massachusetts General Hospital, Boston, to demonstrate the results of the procedures which he has discussed.

RICHARD C. SCHNEIDER, M.D.

**Sunderland, S.: Course and Rate of Regeneration of Motor Fibers following Lesions of the Radial Nerve.** *Arch. Neur. Psychiat.*, Chic., 1946, 56: 133.

As a result of observations on 63 cases of lesions of the radial nerve in a series of 301 consecutive cases of peripheral nerve injuries studied at the One Hundred and Fifteenth Australian General Hospital and the Repatriation Clinic, Melbourne, Australia, the author presents his views on the course and rate of regeneration of motor fibers following complete interruption of conduction in the nerve. Actually, only 31 cases met his criteria.

In the majority of cases, spontaneous regeneration proceeded either to completion or to a degree which contraindicated exploration of the nerve, and attention is called to the fact that this may account for the beneficial results often incorrectly attributed to neurolysis when the latter had been performed prematurely. When the condition of the nerve was not known and exploration was indicated, satisfactory suture could be performed in less than half of the cases (5). Most of the irreparable situations were gunshot wounds associated with fractures of the humerus. The material is carefully described, criteria are stated, and methods of investigation are outlined.

It is stressed that when a nerve regenerates the order of recovery of motor function is usually, but not necessarily, that in which the motor branches leave the nerve. The reasons for variation from this order of reinnervation are discussed. A comparison of observed and deduced pathological conditions of the nerve and the onset of recovery in muscle suggests that the appearance of the nerve at injury is a fairly reliable guide to the probable duration of the regenerative process. However, this is not necessarily a guide to the condition of the individual fibers, for neurapraxia may occur in apparently severe injuries and axonotmesis in nerves which appear normal.

A method of estimating the rate of regeneration of motor axons in peripheral nerves is presented, and emphasis is placed on the fact that it deals only with the growth of functionally mature fibers since the criterion is the progression of return of function. The advantage of this method is that it is not necessary to have a knowledge of the level of the injury and of the delay occurring at that site prior to the onset of regeneration. In addition, by selecting muscles innervated at different levels the rate of regeneration of nerve can be estimated separately over different segments, and one is able to calculate the degree of variation in the rate of progression of regeneration. From the results it is concluded that the mean rate of regeneration over the proximal portions of the nerve is greater than that over the distal portions, and that as the regeneration progresses it does so at a diminished rate. In a study of 3 cases of regeneration after suture, the rate in the proximal segment was 1.2 mm. per day and in the distal segment, 0.6 mm. per day. In the cases of axonotmesis the mean rate was 1.9 mm. per day in the proximal segment and 0.8 mm. per day in the distal segment, which indicated that as regeneration continues it tends to approach the same mean rate as in nerve suture cases. From the data included it would seem that the duration of the initial delay is a measure of the severity of the nerve injury.

The course of regeneration following the onset of recovery may be expressed in terms of the time required to innervate the entire nerve pattern as measured by onset of recovery in the first and last muscles to recover. Factors influencing the time of reinnervation are: (1) variations in linear extent of the pattern, (2) variations in severity of the injury with regard to the area of cross section of nerve involved, and (3) variations in individual rates of regeneration.

In lesions of a minimal degree (axonotmesis) an initial delay of 10 weeks may be expected, whereas in more severe injuries, such as those after suture or those associated with fractures or other complica-

tions, a delay of about 4 months may be expected. When the level of the lesion is known the time required for regenerating axons to reach the brachioradialis or extensor carpi radialis longus may be estimated at 1.9 mm. per day.

The maximum latent period observed before spontaneous regeneration was 10 months, but this was unusual. It is suggested that by adding 11 to 23 weeks, according to the type and severity of injury, and to the date of onset of recovery in the first muscle to recover, it is possible to calculate the approximate time when voluntary contraction may be expected in the last muscle to be reinnervated.

RICHARD C. SCHNEIDER, M.D.

## SYMPATHETIC NERVES

**De Sousa Pereira, A.: Blocking of the Splanchnic Nerves and the First Lumbar Sympathetic Ganglion.** *Arch. Surg.*, 1946, 53: 32.

The author advocates blocking of the splanchnic nerves and first lumbar sympathetic ganglion for various conditions. It is considered a useful procedure in determining the possible results of contemplated operative measures directed at the sympathetic nervous system, and a means of avoiding possible operative failures.

The various methods of injection of the splanchnic nerves are discussed, and the author proposes his own method of blocking the nerve by the posterior approach. X-rays, anatomical sections, and diagrammatic drawings placed upon the patients' backs are used to demonstrate the location for injection.

A discussion of the clinical indications includes: (1) cardiospasm, (2) visceral pain, (3) peptic ulcer, (4) paralytic ileus, (5) megacolon, (6) hypertension, and (7) postoperative condition following abdominal operations.

HOWARD A. BROWN, M.D.

## MISCELLANEOUS

**Turnbull, F.: Surgical Relief of Pain in Cancer.** *Canad. M. Ass. J.*, 1946, 55: 241.

In this short, somewhat philosophical article, the author is impressed by the necessity of stopping even in part, if not wholly, the pain which is the lot of the cancer patient. He admits, as any neurosurgeon will, that the problem is a very difficult one, and that this difficulty lies largely in our insufficient understanding of the various mechanisms of pain in the various pain-producing lesions. He would use the term "unmanageable" rather than "intractable" in describing the pain, believing that it indicates our therapeutic problem.

Realizing the shortcomings of the most accurately performed cordotomy in certain patients, the author contends that cordotomy is, nevertheless, one of the most valuable means at hand of making comfortable many patients who would otherwise be doomed to a terminal existence of heavy, debilitating sedation or agonizing pain. He also makes the wise observation that many such patients, having passed at length through the hands of several "specialists," including the neurosurgeon, are best off when returned to the final care of their own family doctor.

JOHN MARTIN, M.D.

# SURGERY OF THE THORAX

## CHEST WALL AND BREAST

**Lester, C. W.: The Surgical Treatment of Funnel Chest.** *Ann. Surg.*, 1946, 123: 1003.

Funnel chest, which is a funnel shaped deformity of the anterior chest wall, as the name implies, has been recognized for many years under many names, such as pectus excavatum, trichterbrust, and chone chondrosternon, to name a few. Nevertheless, the underlying pathological condition was not discovered nor a satisfactory operation devised until Brown demonstrated that the deformity was due to a short central tendon of the diaphragm, and described a satisfactory surgical treatment. There is an extensive literature on the subject, admirably reviewed by Ochsner and DeBakey, which starts with an article by Bauhinus, written in 1594. Since Brown's article appeared, Sweet has reported his experience with 2 cases. The author is now adding a series of 8 cases, the first of which was operated upon 2 years ago and the most recent, 4 months ago.

When the deformity is fully developed it is characterized by a deep conical depression of the anterior chest wall the apex of which is at the xiphoid. The sternum shows the greatest displacement. The manubrium is at approximately the normal level but from this point the sternum curves sharply backward until the xiphoid approaches the vertebral bodies. Some cases have been described in which the xiphoid was practically in contact with the bodies of the vertebræ, and in the author's first case the distance separating them was only 1 cm. The apex of the depression may be in the midline but it is often to the right of it, which makes an asymmetrical funnel. The ribs and costal cartilages attached to the sternum are proportionately involved in the deformity. The ribs tend to flare out laterally and to turn downward and backward at their sternal ends. This is particularly noticeable in the upper ribs and gives a barrel shape on roentgenological examination. The vertebral column is bent forward into an exaggerated dorsal curve. This, with the chest deformity, produces an extreme example of the "round shouldered, hollow chested" individual, further heightened by the fact that he is also thin and underdeveloped.

The effect of the deformity on the thoracic viscera is that of compression. The lung volume is decreased in proportion to the deformity but seldom to a critical level. The effect on the heart is proportionate to the pressure on it and not necessarily to the degree of deformity. There is frequently a systolic heart murmur, considered to be functional.

Usually, the depression of the sternum pushes the heart into the left hemithorax but there may be considerable displacement before the pressure affects the heart action. On the other hand, if the heart is prevented from being displaced a moderate depression of the sternum can produce limitation of the heart action. The pressure effect is characterized by dyspnea and palpitation on exertion, which may be so great that the patient is practically bedridden. Furthermore, as with other cardiac defects in infancy and childhood, the nutrition is poor and the physical development retarded. In spite of this, the oxygen saturation of the arterial blood appears to be normal. Often there is a psychologic feeling of inferiority—among the boys when they appear unclothed before their fellows, especially when associated with physical limitations, and among the girls when they appear in bathing suits or low necked gowns.

The movement of the thorax during respiration, especially in the vicinity of the deformity, is characteristic of paradoxical respiration. During inspiration the sternum moves backward and the entire funnel deepens, while during expiration the movement is in the opposite direction. In other words, the movements of the thorax are the reverse of the normal respiratory movements. The explanation of this was discovered by Brown, who noted that the central tendon of the diaphragm was unusually short so that contraction of the muscle exerted a pull on the xiphoid and on the costal cartilages of the costal arch, drawing them backward, whereas a normal diaphragm by flattening its dome would allow the sternum and ribs to swing out and increase the volume of the chest. This pull on the sternum produces a deformity which is reversible at first, i.e., in early infancy, but when exerted over a long period of time it makes the deformity permanent unless corrected.

The permanent deformity is maintained also by the substernal ligament. This is a continuation of the linea alba of the abdomen up along the under surface of the sternum to the suprasternal notch. It is a dense fibrous band closely adherent to the sternum and involved in the attachment of the diaphragm to the xiphoid. In the established case this ligament can maintain the deformity even after the overlying sternum has been resected. Furthermore, it seems to have an abnormal importance in dealing with the correction of the deformity.

The cause of the deformity is generally considered to be congenital and hereditary. In many cases some other member of the family can be found who has a similar funnel chest, and not infrequently several members of the family show the deformity.

The symptoms and signs described are not seen in all cases of funnel chest. When they are present operative correction is indicated. Should the patient with obvious funnel chest be without symptoms, nothing is to be gained by operation unless the deformity is increasing or the psychologic state suffers as a result from it. Then, even in the absence of symptoms, the author believes operation to be justified. The surgical treatment is of two types: the first, and more simple, is for the early stages of the deformity in infancy and is contrived to release the

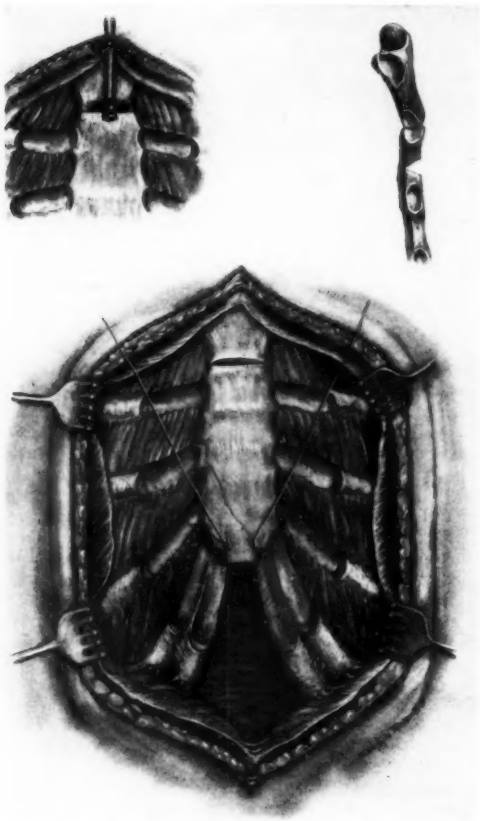


Fig. 1. (Lester). The radical operation. The outer table of the sternum has been cut transversely just below the second rib (wedge osteotomy indicated in inserts) and silver wire has been threaded through drill holes in the lower end of the sternum.

pull of the diaphragm on the sternum and costal arch; the second is designed to correct a deformity which has been established and must not only release the diaphragmatic pull, but also correct the bony deformity which has resulted from this pull.

The author then describes the operative procedure and gives a series of 8 cases with complete studies thereof. He summarizes his article by the following statements:

Funnel chest is a deformity of the sternum characterized by a funnel shaped depression of the sternum with the apex at the xiphoid. It is caused by a short central tendon of the diaphragm which pulls backward on the xiphoid during inspiration. It may produce pressure on the heart, causing palpitation, dyspnea on exertion (sometimes extreme), and chronic malnutrition and underdevelopment. In infancy, when the deformity is in a reversible stage a simple operation suffices to correct it. Later, when the deformity has become fixed, a much more extensive operation is necessary. Operation results in a high percentage of satisfactory results.

PAUL MERRELL, M.D.

**Wade, P.: Untreated Carcinoma of the Breast.** *Brit. J. Radiol.*, 1946, 19: 272.

Twenty-seven cases of untreated carcinoma of the breast are analyzed. The survival rates of approximately 827 cases are collected from various sources. Seven hundred and fifty-seven of the cases are classed according to the age of the patients. A comparison is made between the survival rates in 177 treated advanced cases and the results of palliative treatment in 201 other cases. Factors influencing the mean duration of life are discussed. The duration of the untreated disease is not proved to have a definite relation to the age of the patient, although the cases recorded show a slight increase in duration of the disease in the middle age groups. There is a wider variation in duration in the younger age groups, but the duration in the older age groups deviates less from the mean duration. Long durations, such as from 20 to 30 years, are unlikely in an age group having a normal expectation of life that is shorter than this period. The treatment of selected advanced cases increases the duration of life and raises the survival rate at all periods. Therefore, treatment enables the patients to regain a percentage of their normal expectation of life, which they would not have had were the disease to remain untreated. The later history of a group of treated and untreated patients should relate to the state of the disease at any given period, and to the duration of life compared with that of an individual of the same age but not known to be suffering from the disease.

EMIL C. ROBITSHEK, M.D.

**Halberstaedter, L., and Hochman, A.: Artificial Menopause and Cancer of the Breast.** *J. Am. M. Ass.*, 1946, 131: 810.

Between May, 1938 and January, 1945 the authors induced artificial menopause by irradiation of the ovaries in 60 women with cancer of the breast. The tumors were classified according to Steinthal as those of Stage I—with no evidence of lymph node metastases at operation; those of Stage II—with microscopic evidence of metastases to the axillary lymph nodes without evidence of involvement of the neighboring tissues and organs; and those of Stage III—with involvement of the adjacent or distant tissues or organs.

Only 60 of 393 women with carcinoma of the breast seen during the period of study were irradiated to produce an artificial menopause. As a rule the artificial menopause was induced when metastases could be identified.

Improvement occurred in 56 per cent of the women in this series. The authors are more liberal in their use of the word "improvement." They con-

sider it proper to report a case as improved if there is alleviation of the symptoms, whereas most authors report cases as improved if regression of the metastatic infiltration can be shown objectively.

Metastases to the bone responded particularly well to the induction of the artificial menopause, improvement occurring in 69 per cent of the cases; metastases to the pleura and lung reacted favorably in 50 per cent of the cases; metastases to the skin and local recurrence reacted less favorably; and metastases to the lymph nodes showed little response. Brain and liver metastases showed no response.

Six of eight patients who had ovarian sterilization as a preventive measure are alive, and there is no clinical evidence of metastases.

The best chances of improvement resulting from ovarian sterilization are found in those cases of cancer of the breast in which the tumor cells are euplastic and typical, the so-called adenocarcinomas. The chances of improvement are far fewer in the cases in which the cells are anaplastic and atypical, the so-called carcinomas simplex.

Improvement following irradiation of the ovaries is temporary, lasting from ½ year to 2 years in the authors' series. This is probably due to the fact that sterilization by irradiation or surgery does not completely stop the flow of ovarian hormones in the body. EARL O. LATIMER, M.D.

**Adair, F. E., and Herrmann, J. B.: The Use of Testosterone Propionate in the Treatment of Advanced Carcinoma of the Breast.** *Ann. Surg.*, 1946, 123: 1023.

Many investigators have demonstrated that the administration of estrogenic hormones has produced mammary carcinoma in mice. An attempt to counteract this carcinogenic effect of estrogens by means of androgens was a logical sequence. This principle of inhibiting the activity of gonadal hormones of one sex by the administration of gonadal hormones of the opposite sex has been employed in recent years in the treatment of cancer.

Encouraging results have been obtained in the treatment of prostatic cancer by estrogens. There are, however, surprisingly few reports on the use of androgens in the treatment of human carcinoma. In 1939, Ulrich and Loser described favorable changes in patients with advanced carcinoma of the breast coincident with the administration of testosterone propionate. More recently, other authors have published similar findings.

The authors report a series of 11 cases with the following summary and conclusions:

1. No toxic effects were noted in individuals with normal serum calcium levels, each of whom received several thousand milligrams of testosterone propionate over a period of 3 months.

2. Four patients (one with soft-part, and 3 with osseous metastases) manifested remarkable improvement.

3. Evidence of improvement was the regression of the primary lesion and soft part metastases in 1 case, and an increase in calcification in areas of osseous metastasis in 3 cases.

4. Disappearance of pain coincided with the osteoblastic changes.

5. In 2 of the cases that exhibited deposition of calcium in the bone metastases there was a coincident elevation of the serum alkaline phosphatase.

6. Four patients did not respond to therapy and 3 others are still under treatment, without clinical evidence of improvement. On microscopic study, metastatic nodules from 2 of the latter group revealed hydropic changes.

7. One patient with an initial hypercalcemia associated with osseous metastases manifested a further rise in serum calcium associated with toxic manifestations in consequence of testosterone therapy. This emphasizes the importance of blood chemical studies in patients receiving this treatment.

8. We believe that testosterone propionate in large doses may, in certain instances, exert a favorable influence on advanced carcinoma of the female breast.

9. The number of cases studied is too small to gauge the frequency of this favorable reaction. From our limited experience the beneficial effects are unpredictable and uncertain. Likewise, the duration of the favorable response and the amount of testosterone propionate necessary to maintain this improved status is as yet unknown. PAUL MERRELL, M.D.

## TRACHEA, LUNGS, AND PLEURA

**West, J. P.: Chest Wounds in Battle Casualties.** *Ann. Surg.*, 1946, 123: 986.

The author's report deals with 206 battle wounds involving a thoracic cavity. The wounds of the chest cavity are classified under four headings and are discussed separately.

Eighty-seven penetrating wounds of the chest did not require thoracotomy. These patients had relatively minor wounds involving the chest cavity, and received no treatment other than aspiration and debridement of the chest wall wounds. Three of these patients had a hemopneumothorax. There was one death in the group—that of a soldier admitted to the hospital with a clostridial infection in a compound fracture of the arm. Death was thought to be caused by the toxemia of the clostridial infection although autopsy revealed extensive intraplumonary hemorrhage. Forty-six patients were admitted with penetrating wounds and required thorocotomy. Thirty-five patients were admitted with sucking wounds of the chest, and 38 patients had a combined thoracoabdominal wound.

There were 17 deaths in the entire series, and the author comments upon the results as follows:

Of the 87 patients with penetrating wounds not requiring thoracotomy there was only 1 death, a mortality of 1.1 per cent. Of the 46 patients with penetrating wounds requiring thoracotomy there were 4 deaths, a mortality of 8.7 per cent. Of the 35 patients with sucking wounds, there were 4 deaths, a mortality of 11.4 per cent. Of the 38 patients with thoraco-

abdominal wounds, 8 died, a mortality of 21 per cent. It will be observed that the total mortality in this series is approximately half that of the previous series.

In the two series combined, there is a total of 361 thoracic cases, which represents 3.6 per cent of the 10,700 battle casualties treated in the Second Evacuation Hospital between July 1, 1944 and March 1, 1945. The total mortality for the combined series of 361 cases was 42, or 11.5 per cent. Twelve patients with chest wounds who died in the shock ward before operation are not included in these figures.

The following conclusions are based upon the total experience to date:

1. Small penetrating wounds of the chest cavity are best treated by aspiration alone.

2. Penetrating wounds of the chest cavity require a limited thoracotomy (1) when the skin incision necessary for debridement of the chest wall wound causes sucking; (2) when there is extensive damage to the chest wall and roentgenographic evidence suggests severe lung damage; (3) in the presence of progressive bleeding; and (4) when large easily removable foreign bodies are present.

3. In treating sucking wounds of the chest, the wound should be enlarged enough to allow suture of a laceration of the lung, removal of foreign bodies and evacuation of blood clots, as well as a complete debridement of the chest wall wound.

4. In many cases thoracoabdominal wounds can be dealt with through a thoracotomy incision alone. In other cases the major injury is in the lower abdomen. These patients require celiotomy after treatment of the chest wound. PAUL MERRELL, M.D.

**Samson, P. C., and Brewer, L. A., III.: Principles of Improving Inadequate Tracheobronchial Drainage following Trauma to the Chest.** *J. Thorac. Surg.*, 1946, 15: 162.

De Takats showed experimentally that thoracic wall trauma resulted in bronchial spasm and increased bronchosecretory activity. The tracheobronchial tree of patients with thoracic wounds is filled with tenacious mucous and purulent secretions. Because of the prevalence of bronchitis in soldiers under combat conditions, particularly during the winter months, purulent bronchial exudate often antedates injury. Bloody or mucoid sputum which becomes purulent indicates developing infection. Fluid in the pleural cavity may give bronchial symptoms primarily, especially in the presence of a bronchopleural fistula. Necrotic mucosa, debris, and membranous exudate from burns of the lower airway and from the local action of certain poison gases may cause widespread tracheobronchial obstruction within a few days after injury.

Present in thoracic injuries are factors which disturb clearing of the tracheobronchial tree by effective cough. Among these are thoracic wall pain, diaphragmatic injury or paresis (reflex?), abdominal ileus, fluid in the pleural cavity, and paradoxically movable chest wall from multiple rib fractures.

Signs and symptoms are easily recognizable. There is constant inefficient "wet" cough with a persistent rattling or gurgling element. Only superficial secretions are raised. Bronchial rales with a wheezing high pitched dry quality which may often be heard at the bedside are commonest. There may be sonorous rales. The patient appears to be having an asthmatic attack. Dyspnea usually means a diffuse, partial bronchial obstruction with anoxia. Distant bronchial breathing changes in intensity and location with a forced cough signifying patchy lobular atelectasis, which, if allowed to persist, becomes pneumonitis.

Roentgenograms should be taken in at least two planes. Intrapulmonary bleeding per se will not cause cardiac or mediastinal shift. Shadows are likely to be round or oval with small loculated air pockets, and must be differentiated from shadows caused by atalectasis, and from chest wall contusions and pleural lesions.

Important initial steps in treatment are thoracentesis, gastric and intestinal decompression, intercostal or paravertebral block, and inhalations of 100 per cent carbon dioxide (rebreathing into a paper bag may be substituted). If there is continued evidence of blockage, mechanical aspiration of the tracheobronchial lumen by catheter or bronchoscopy is resorted to without delay. A simple technique for tracheal toilet with an endotracheal catheter, which may be done at the bedside, is discussed in detail. An unusually flaccid epiglottis is the only condition which prevents passage of the catheter, and that is extremely rare.

Bronchoscopic aspiration is a more efficient procedure than catheter suction. Since it is done under direct vision, both stem bronchi will be aspirated in a more efficient manner. The use of curved suction tips allows more adequate drainage of the smaller bronchi. Further increase in the airway is provided by mucosal shrinkage with pontocaine (or cocaine) and epinephrine. The sicker the patient the more immediate is the necessity for bronchoscopy, and it is mandatory if an unconscious patient has aspirated vomitus.

In conclusion the authors state that (1) bronchial obstruction may be present in patients with chest injuries as a result of retained fluid substances in the pulmonary tree; and (2) that persistent bronchial obstruction is an important factor in the development of pulmonary atalectasis and pneumonitis following thoracic trauma.

The principles of improving inadequate tracheobronchial drainage are discussed. Illustrative cases are presented. LYNN JOHNSEN, M.D.

**Berg, S.: Combined Intrapleural and Extrapleural Pneumothorax (Pneumothorax Mixte).** *Acta med. scand.*, 1946, Supp. 170, p. 408.

Following the introduction of cauterization of adhesions according to the Jacobaeus method, it became possible to extend the limits of pneumothorax treatment and achieve an effective collapse of the lung in

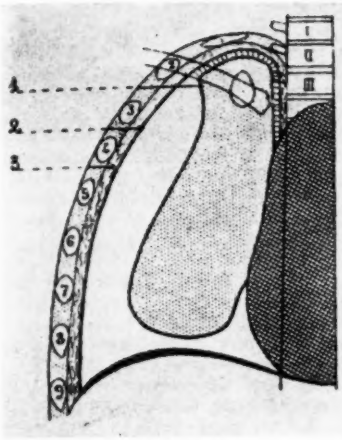


Fig. 1

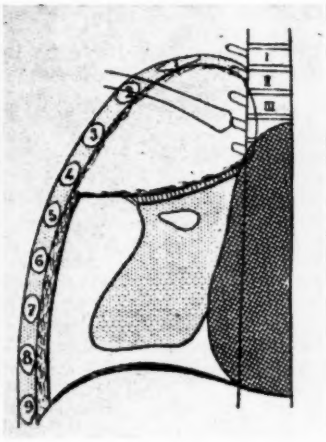


Fig. 2

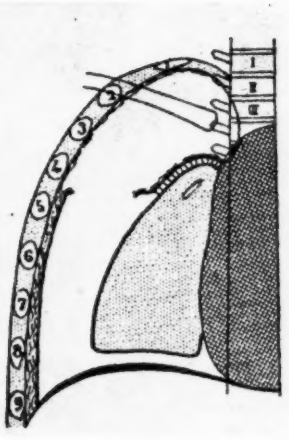


Fig. 3

Fig. 1. (Berg). Incomplete pneumothorax with adherent apex. 1. Pleura visceralis. 2. Pleura parietalis. 3. Extrapleural layer of tissue.

Fig. 2. (Berg). Intrapleural and extrapleural pneumothorax. Apex part detached below the lower limit of adhesion. A horizontal part of the pleura parietalis distended between the upper part of the lung and chest wall.

Fig. 3. (Berg). Combined extrapleural and intrapleural pneumothorax, ("Pneumothorax mixte"). Pleura cut through right round. Combined pneumothorax cavity established. Pleura parietalis covers apex region.

cases in which it would otherwise not have been feasible. In a number of cases, however, the desired effect of the collapse is not obtained, because of the existence of adhesions which cannot be removed by means of intrathoracic cauterization. This is particularly the case in the presence of extensive adhesions in the apex region.

The author reports 5 cases in which, following a rib resection, the adherent part of the lung was freed by separation of the tissue lateral to the parietal pleura and cutting of the detached parietal pleura, which created a combined intrapleural and extrapleural pneumothorax, a "pneumothorax mixte." The procedure is best explained by the accompanying schematic pictures. SAMUEL KAHN, M.D.

**Lista, G. A.: Latent Bronchial Carcinoma with Initial Cerebellar Symptoms** (Carcinoma bronquial latente con sintomatología inicial cerebelosa). *Prensa méd. argent.*, 1946, 33: 1232.

Bronchial carcinoma may cause nervous symptoms either from pressure on various nerves or from metastases in the brain. Metastases of bronchial carcinomas are very frequent in the cerebrum. It is said that of every 9 tumors of the brain 1 is metastatic, and that 28 per cent of these metastases are from bronchial carcinomas. This is true to such an extent that at the Mayo Clinic a roentgenogram of the thorax is made at once in every case of tumor of the brain.

Nevertheless, metastases of bronchial carcinomas in the cerebellum are rare; it is still rarer for them to occur without metastases elsewhere in the brain and for them to cause symptoms while the bronchial carcinomas are still latent symptomatically, although the latter finding is not extremely unusual in metastases in the cerebrum.

Such a case of cerebellar metastasis with cerebellar symptoms preceding pulmonary symptoms is described in a man of 49. Three months before admission to the hospital his gait became unstable and after about a month he presented dizziness, headache, nausea, and vomiting. He was finally obliged to go to bed and on admission to the hospital he showed mental confusion in addition to the above symptoms; he had lost 8 kgm. in weight. He showed a tendency to fall to the left. Romberg's sign was negative. There were no respiratory symptoms. Lumbar puncture could not be performed on account of calcification of the vertebral ligaments. Cisternal puncture showed increased pressure of the spinal fluid. The symptoms indicated tumor of the left cerebellum and a roentgenogram of the thorax showed great enlargement of the hilar shadow to the right.

Later roentgenograms very plainly showed a tumor of the posterior part of the right lower lobe. A diagnosis was made of metastatic cerebellar tumor associated with the bronchial tumor on the right side. A decompressive operation was performed with some relief of the brain symptoms but the patient died after a period of about 2 months of acute bronchopneumonia and cachexia.

AUDREY G. MORGAN, M.D.

## HEART AND PERICARDIUM

**Harken, D. E., and Williams, A. C.: Foreign Bodies in, and in Relation to, the Thoracic Blood Vessels and the Heart. Migratory Foreign Bodies within the Blood Vascular System.** *Am. J. Surg.*, 1946, 72: 80.

Three cases of migratory foreign bodies successfully removed from intrathoracic blood vessels, and the salient aspects of the surgical technique employed are reported in this article. Each of the patients was wounded in battle, the first in the intraclavicular region by a 30 caliber machine gun bullet. On thoracotomy the bullet was palpated in the left pulmonary artery but it became dislodged accidentally. Subsequently it was found in the right pulmonary artery at a second operation. A schematic drawing illustrated the probable migration of the bullet.

The second patient received a shell fragment in the right upper mediastinum. At operation the fragment was discovered in the upper portion of the innominate artery. The artery was completely intact. As to the course taken by the missile, it was suggested that it entered the right side of the chest and the pulmonary vein, or the left side of the heart, then carried into the aorta and thence to the innominate artery where it lodged.

The third patient was struck in the right axilla at the level of the fifth rib by a machine gun bullet. At operation the bullet was found to lie in an abscess cavity anterior to and including the anterior surface of the lower branch of the left pulmonary artery. On removal, a full arterial stream issued from the defect. Débridement of the cavity and repair of the artery resulted in complete recovery. It was thought that the bullet must have entered the circulation through the liver, then entered the inferior vena cava, the right auricle, right ventricle, and left the heart by way of the pulmonary artery.

Four cardinal indications for removing intravascular foreign bodies are presented: (1) to avoid the hazards of vascular occlusion; (2) to diminish the dangers of sepsis (local and systemic); (3) to prevent erosion and hemorrhage; and (4) to remove the possibility of embolism. Each of the 3 cases reported had one or the other of these indications for surgical intervention. STEPHEN A. ZIEMAN, M.D.

**Gross, R. E.: Technical Considerations in Surgical Therapy for Coarctation of the Aorta.** *Surgery*, 1946, 20: 1.

Coarctation of the aorta is a congenital abnormality which can be corrected by direct surgical attack on the lesion. The narrowed or completely obstructed segment can be excised, and the remaining portions of the aorta can be brought together by an end-to-end anastomosis. Gross discusses the technical considerations in surgical correction for coarctation of the aorta in 5 patients so treated.

For anesthesia, the author prefers cyclopropane, administered through a tightly fitting face mask. A vein cannula in an ankle vein is used to permit the administration of fluids and blood during and after the operative procedure.

The surgical approach is made through the posterior thoracic wall by means of a liberal incision. The aorta is exposed by a longitudinal incision of the overlying parietal pleura from the midthoracic area up over the aortic arch and over the left subclavian artery. This permits the narrowed portion of the artery to be readily seen and palpated. Severing of the vessels to free the aorta from the surrounding structures is done cautiously, and when the ligamentum arteriosum is cut a high degree of mobility is gained for the aortic segment. Within the mediastinum the left vagus nerve and the recurrent laryngeal nerve are to be kept in mind and constantly avoided. A revamped Moynihan straight intestinal clamp without rubbers is employed for clamping the aorta. This instrument accommodates vessels of various sizes; it cannot slip sidewise and permits considerable pressure with very little crushing effect. Silk constitutes the suture material and the aortic anastomosis is accomplished as far as possible by means of the usual type of Carrel stitch. It cannot, however, be relied upon uniformly; therefore a continuous mattress type of stitch including all layers, bringing intima to intima, and turning the vessel ends outward is employed.

The prevention of cardiac collapse is accomplished by (1) removing the remaining (upper) aortic clamp gradually over a period of 5 or 6 minutes so that the rush of blood into the lower aortic segment is somewhat retarded; (2) tipping the patient into a mild Trendelenburg position to facilitate the return of blood to the heart; and (3) quickly injecting from 150 to 250 c.c. of blood (under pressure) into the ankle vein cannula to augment the circulating fluid.

The chest is closed carefully, care being taken to avoid bleeding into the pleural cavity. The wound usually heals per primam. By removing segments of the ribs so that the ends of the bone cannot touch, postoperative pain can be kept at a minimum and sedation markedly reduced. Postoperative accumulation of fluid in the pleural cavity is aspirated as required. STEPHEN A. ZIEMAN, M.D.

**Fauteux, M., and Swenson, O.: Pericoronary Neurectomy in Abolishing Anginal Pain in Coronary Disease: An Experimental Evaluation.** *Arch. Surg.*, 1946, 53: 169.

It is generally believed that the nerve fibers carrying pain impulses from the heart and coronary vessels follow the course of the coronary vessels. They are concentrated for the most part around these vessels, forming a loose spiral network, and congregate around the origins of the coronary arteries before passing over to plexuses located between the pulmonary artery and aorta, and on the surface of the aorta. Pressor and depressor fibers are present in the plexus between the pulmonary artery and aorta. It is important to interrupt the pain fibers as near the heart as possible, not only for the essential reason

of not missing any, but also for the reason of avoiding severance of important nerve branches to the lungs, which is not without serious risks.

The objectives of surgery in the therapy of coronary disease are the improvement of coronary circulation, blockade of vasomotor reactions, and the eradication of anginal pain. The operations of cervical and dorsal sympathectomy interrupt some pain pathways but it has not been proved that all pathways have been cut nor that circulation improves. Clinical experience has borne out this belief.

Investigation has shown, experimentally and clinically, that venous ligation aids in opening and dilating the arterial anastamoses of the extremities. This view is tenable in the case of the coronary circulation also as evidenced by the studies following coronary venous ligation.

With these thoughts in mind, the operation of pericoronary neurectomy was devised. If it would block reflexes then it should abolish anginal pain. Experimental work on the dog showed that in controls there was 20 per cent survival after ligation of the circumflex artery. In a group of dogs prepared by coronary venous ligation, there was 50 per cent survival after ligation of the artery. In a third group prepared by pericoronary neurectomy alone, the survival rate was 60 per cent after arterial ligation. In a fourth group prepared by pericoronary neurectomy and coronary venous ligation, the survival rate was shown to be 86 per cent following ligation of the artery.

The conclusions drawn were that coronary venous ligation helps to open and dilate the coronary anastamoses and that pericoronary neurectomy blocks reflexes, thus aiding in the prevention of ventricular fibrillation and rapid death. The unsolved problem in these studies was the extent to which the operation could diminish pain in coronary disease.

The experimental method for the study of cardiac pain, which has become fairly well standardized, was devised by Sutton and Lueth. This method was applied to a control group of dogs which reacted as postulated. It was also applied to a group of 10 dogs prepared in advance by pericoronary neurectomy. Of this group, 6 gave no response, 1 gave no response on five occlusions and a questionable response on another, 2 were doubtful, and 1 had a positive reaction graded one plus. One dog in the series developed a ventricular tachycardia on the first occlusion with no evidence of pain. It is interesting to note that these attacks are often followed by ventricular fibrillation in the intact dog.

Two patients who have submitted to the operation of pericoronary neurectomy combined with ligation of the great cardiac vein, have been under observation for more than a year. Seven others who have been operated upon more recently are under observation. The clinical results are in accord with the experimental findings. As yet no final judgment can be reached regarding the procedure, but there seems to be enough justification for further clinical trial.

EDWIN W. PASSARELLI, M.D.

# SURGERY OF THE ABDOMEN

## GASTROINTESTINAL TRACT

**Kaijser, R.: Nutritional Abdominal Allergy from a Surgical Standpoint** (Ueber nutritive abdominale allergie vom standpunkt des chirurgen). *Acta. chir. scand.*, 1946, 94: Supp. 3.

The first 118 pages of this work are concerned with a review and evaluation of the literature of the general subject of allergy in an attempt to establish some norms in the universal conflict of experiences and opinions.

Particular attention has been allotted to the consideration of the subject of allergy in the special surgical subjects of gastric and duodenal ulcer, of diseases of the bile passages, of appendicitis, and of a few other disease pictures of surgical interest in the realm of abdominal allergy. The remaining 206 pages are taken up with the author's clinical and histopathological studies of the role played by allergy in these same surgical conditions.

The various methods of study considered in the first part, such as the Prausnitz-Kuestner test, the matter of food antipathies, the exposure of the patient to the suspected food entities or food categories and the withholding of these factors, and the leucopenic index, are given but brief attention, almost exclusive study being made of the skin tests. The histopathological part is concerned with the occurrence and significance of the local tissue eosinophilia in cases of ulcer, cholecystitis, and appendicitis.

The material consisted of 705 patients, of which 92 (68 males, 24 females) presented cases of gastric or duodenal ulcer, 86 (10 males, 76 females) disease of the bile passages, 159 (88 males, 71 females) appendicitis, and 310 (146 males, 164 females) various forms of abdominal distress of undetermined nature. The control material consisted of 88 patients (69 males, 19 females) who were not suffering from any of the cited surgical abdominal conditions and were not presumed to be affected by allergic disease. The cutaneous tests were made on the upper part of the back. They were chiefly intracutaneous and were at first conducted with the extracts of Parke-Davis and Co., and later with the extracts prepared by Frugoni after the method of K. Hansen of Luebeck.

From his studies the author considers that food allergy is not of material significance in the pathogenesis of gastric or duodenal ulcer, the tissue eosinophilia probably resulting from local changes in the ulcer. However, some cases of gastritis with local eosinophilia, may be the result of food allergy. As regards the bile passages, food allergy may cause acute biliary colic or induce certain abdominal symptoms which remain after cholecystectomy; however, such conditions are not believed to play any great part in the causation of bile tract disease. Here again the local eosinophilia of the gall bladder is assumed to be merely an aspect in the normal development of the cholecystitis, or it may be an expression of an allergy which in a few cases might cause a special, less acute type of cholecystic inflammatory reaction. In appendicitis the eosinophilia observed in the mucosa, or even that type of local infiltration permeating the entire wall of this organ, is interpreted to be of about the same significance as that observed in the case of gall bladder disease. Finally, in the group of less well characterized abdominal symptoms, allergy is obviously one of the various etiologic factors which may be at work; however, in a large series of cases it cannot be considered as of paramount importance.

Nevertheless, in the gastrointestinal inflammations the question of allergy is of great significance, because allergy frequently gives rise to the clinical features of an acute abdominal condition. This group the author divides into 6 subgroups.

The first of these subgroups consists of those cases presenting the symptoms of disease of the urinary tract, liver or bile passages, of tuberculosis lymphadenitis or peritonitis, or of intraperitoneal adhesions. Here in the author's material there was no instance of suspicion of a nutritional allergic etiology for the manifestations.

The second subgroup comprises apparently gynecological affections, and the third comprises the cases of achylia gastrica, without any evidence of allergy.

The remaining 3 groups consist respectively of cases of gastritis, enteritis, and colitis in which the incidence of positive skin tests was somewhat greater than in the control group although not sufficient to constitute a statistically demonstrated difference; in none of these groups could allergy play a predominating role as an etiologic factor. In these patients there is usually a discrepancy between the subjective and objective manifestations. The patient complains of severe pains with little or no pain on pressure, and the defense musculaire is slight or absent. The temperature is normal or but slightly elevated; it may, however, exceed 39 degrees. A moderate amount of leucocytosis may be present, but an eosinophilia will seldom accompany the acute attack.

Finally, the author reports an apparent instance of pancreatic irritation which seemed to have been caused by nutritional allergy; however, he does not consider it of sufficient import to have any bearing on the subject here treated. This case and a few other experiences are considered of value for further studies on the subject of nutritional allergy in surgical abdominal conditions, and the author recommends especially that attention be given to the selection and employment of more reliable allergens.

JOHN W. BRENNAN, M.D.

**Bell, H. G.: The Treatment of Cardiospasm by Esophagogastrostomy.** *Surgery*, 1946, 20: 104.

The etiology of cardiospasm is still in dispute. Comparatively few cases are reported in which an operation was performed in an attempt to relieve the condition.

Dilatation is the simplest procedure and should always be given a trial. Of the operative procedures, esophagogastrostomy seems the most logical. The author reports on 10 such procedures. The results were very satisfactory; there were no deaths and 8 of the 10 patients received complete relief. Two patients required subsequent operations.

In the last 2 cases the flaplike valve action of the redundant posterior wall of the anastomosis caused the persisting symptoms. A method of correcting this in which a stitch is used to anchor the posterior wall of the anastomosis to the posterior wall of the stomach is described. F. J. LESEMANN JR., M.D.

**Grimson, K. S., Reeves, R. J., Trent, J. C., and Wilson, A. D.: The Treatment of Patients with Achalasia by Esophagogastrostomy.** *Surgery*, 1946, 20: 94.

Progressive dysphagia and starvation occasionally necessitate surgical intervention in cases with derangement of function of the lower esophagus.

The authors report on a series of 9 cases in which an esophagogastrostomy was performed on patients with achalasia. A transabdominal approach was utilized, the esophagus was mobilized, and care was taken to bring down the dilated segment of the esophagus. Incisions were made into the esophagus and fundus and an anastomosis was performed. There were no operative mortalities in the 9 cases. The cases exhibited marked improvement.

The theories of causation of the disorder are discussed. The authors believe that the esophageal dilatation is secondary to the chronic obstruction and not idiopathic. Cases in which a sympathectomy was performed for hypertension revealed no disturbance of esophageal function. Similarily, cases in which a vagotomy for peptic ulcer was performed revealed no disturbed function. The authors believe that the myenteric plexus easily controls motility by itself and may be only partially regulated by sympathetic and parasympathetic impulses. The fundamental pathology may reside in lesions of the myenteric plexus. F. J. LESEMANN, JR., M.D.

**Walters, W.: Diverticula of the Stomach.** *J. Am. M. Ass.*, 1946, 131: 954.

Five cases of diverticula of the stomach were presented. All the patients concerned had symptoms of severe dyspepsia which had led them to seek medical and surgical treatment. Two of the patients had been managed on a medical regimen for peptic ulcer prescribed elsewhere, in the belief that a gastric ulcer was present in 1 case, and a duodenal ulcer in the other.

In each case roentgenological examination of the stomach at the Mayo Clinic revealed the presence of a diverticulum. Gastroscopic examination was performed in but 1 case; in another case it had been performed elsewhere before the patient came to the clinic. In 1 case the diverticulum was not found at the first operation, but since the symptoms persisted, a second operation was performed, at which time the diverticulum was found and removed. Four patients were relieved of their symptoms of epigastric pain after removal of the diverticula; the diverticulum of a fifth patient was inverted, and comparable relief was obtained thereby.

In all cases the diverticula extended from the posterior wall of the stomach, just off the lesser curvature. In 4 cases the surgical approach to the area

Fig. 1. (Grimson, K. S. *et al.*) The drawings illustrate the importance of extending the incision for esophagogastrostomy or cardioplasty through the stomach and small lower esophagus into the enlarged portion of the esophagus to insure adequate drainage. Suction, rather than the use of temporary clamps or ties about the esophagus, facilitates upward extension of the incision.

in question was made by dividing the gastrolienal ligament and the gastrocolic omentum, which permitted exposure of the diverticulum by drawing the fundic end of the stomach downward and toward the midline. In 1 case the diverticulum was approached through the gastrohepatic omentum. In the fifth case, the presence of multiple blood vessels in the wall of the diverticulum, plus the inflammation present in the diverticulum as a result of the retention of food, undoubtedly accounted for the hemorrhagic episodes.

Retention of food in the diverticula undoubtedly produces gastrospasm; this, plus the diverticular gastritis, accounts for the pain.

**Natucci, G.: Fibromas of the Stomach** (Sui fibromi dello stomaco). *Minerva med.*, Tor., 1946, 1: 251.

The author describes a case in which a true fibroma of the stomach was accidentally found at autopsy. In reviewing the literature, he describes the clinical and anatomical characteristics of benign tumors of the stomach which, by their location, symptomatology and complications suggest malignancy and for this reason are usually treated surgically and radically.

Benign tumors of the stomach, in contrast to the malignant ones, are rare and were considered exceptional up to some time ago. In spite of the progress in diagnosis the pathologicoanatomical literature remains scarce; in the world's literature 6 fibromas were reported in 1929, 14 in 1922, 22 in 1927, 40 in 1932, and 63 in 1941, in contrast to the notable number of myomas (386) and papillomas (316). In order of frequency the true fibromas come after the myomas, papillomas, and adenomas.

Fibromas of the stomach are interesting because of their rarity and because of their clinical symptomatology which very often simulates that of a malignant tumor and misleads the clinician, radiologist, and surgeon. Diagnosis of benign tumors of the stomach is rather difficult because the clinical subjective and objective symptoms are common to other stomach affections (gastritis, ulceration, carcinoma), and only by the histological examination can we arrive at a correct diagnosis.

The author describes a case of true fibroma of the stomach found accidentally at autopsy in a patient who died from pneumonia. He gives the pathological (macroscopic) and histological (microscopic) description and states that the tumor originated from the submucous connective tissue solely. According to the literature the fibroma of the stomach is usually rounded or oval and of a firm elastic consistency; it varies in size from that of a nut to that of an adult head, the average being that of a hen's egg; it is often pedunculated; its weight varies with its size, reaching as much as 5,500 gm.; and its surface is smooth or slightly irregular and broken which gives it a tendency to ulcerate. On section the surface is a pallid gray, the tendonlike reflections revealing tortuous undulating bundles with connective tissue fibers. This tumor is generally found in men of middle age. The lipoma may be differentiated by its softness and yellow color; the myxoma by its special consistency and gelatinous transparent aspect; the angioma by its richness of vessels; and the sarcoma by its red beefy color and scarcity of connective tissue fibers, which differentiates it from the fibromas or myomas. However, the fibromatous, myomatous, and neurofibromatous tumors cannot be differentiated easily at operation. The tuberculous and luetic granulomas with neoplastic form cannot be differentiated at first sight from true tumors and frequently only a histological examination will lead to their correct diagnosis.

G. Albin Liva, M.D.

**Gaspar, J. B., and Vidal-Colomer, E.: Thread Employed as Suture Material in the Stomach as the Possible Cause of Postoperative Complications** (Los hilos de sutura gástrica como posible causa de complicación postoperatoria). *Rev. espan. enferm. ap. digest.*, 1946, 5: 223.

This article concerns 4 cases in which some form of surgical treatment for ulcers had been done and in which a recurrence of the subjective symptoms took place subsequently.

X-rays showed the presence of an ulcer, and gastroscopic examination revealed the association of nonabsorbable thread used as suture material in the first operation.

The patients were operated upon by different surgeons and the technique employed was different in each case. The gastroscopic appearance of the lesion and the proximity of the thread demonstrated the causal relationship beyond doubt.

Stephan A. Zieman, M.D.

**Blain, A., III, and Kennedy, J. D.: The Effect of Penicillin in Experimental Intestinal Obstruction.** *Bull. Johns Hopkins Hosp.*, 1946, 79: 1.

In this experimental study on 20 dogs, a simple intestinal obstruction was produced by division of the ileum and closure of the ends. Strangulation of a portion of the proximal part of the ileum was produced by ligation of all the veins over a 60 cm. length of bowel and ligation of all vessels over a short segment of this portion.

All dogs received blood transfusions routinely following surgery and these were repeated as indicated by frequent hematocrit determinations. Saline solution was given in sufficient quantities to prevent hypochloremia. Gelatin solution was given if the hematocrit rose despite the administration of saline solution.

Ten of these dogs received no further treatment and survived from 16 to 35 hours. Pathologically, the bowel was swollen and contained blood (unless a perforation had occurred). The peritoneal cavity contained from 500 to 2,000 c.c. of a bloody transudate resembling blood serum with a hematocrit between 12 and 15. Ulceration and necrosis of the bowel wall were marked.

The other 10 dogs were treated with massive doses of penicillin in addition to the treatment outlined

above. One dog died in 26 hours, while 9 were protected for 50 hours or more, and 8 for 72 hours or more. Two dogs were subjected to resection and side-to-side anastomosis after a period of 72 hours and were cured.

The bowel at autopsy in the penicillin treated group was generally thick and firm instead of friable as in the control group. Microscopically, there was hemorrhage, necrosis, and ulceration. In some dogs some healing was seen; less infection was present; otherwise the findings were identical with the control group.

Careful and complete blood chemical studies were made and reported. Bacteriological studies showed that the same organisms were present as at the time of operation in both groups.

The authors conclude that penicillin in massive doses prolongs life in strangulated ileal obstructions for a limited period of time. A plea is made for antibacterial therapy in all cases of strangulated obstructions or cases in which strangulation cannot be ruled out preoperatively, but as an adjunct to, and not as a substitute for, early and adequate surgical procedures. THOMAS C. DOUGLASS, M.D.

**Bohmansson, G.: The Problem of Surgical Arrest of Massive Hemorrhage in Peptic Ulcer.** *Acta chir. scand.*, 1946, 94: 362.

Widely divergent opinions are still held by the advocates of active surgical intervention, on the one hand, and those who recommend expectant medical treatment, on the other, in the treatment of acute hemorrhage due to peptic ulcer.

The author's observations are based on over 200 cases of hemorrhage due to ulcer, which were submitted to operation during the acute stage of the hemorrhage. The author considers the factors which should be borne in mind in deciding for or against operation. After reviewing the work of Meulengracht, he believes that although the mortality was only 1 per cent, the primary material was not classified according to the severity of the hemorrhage, and it is therefore not directly comparable with that in other statistical surveys.

Treatment with food, fluids, and blood transfusions has considerably improved the prognosis in cases treated conservatively. A typical example is cited in the statistics from Orebro, Sweden, since 1939, when the benefits of this form of therapy were recognized. The percentage of cases of manifest hemorrhage treated operatively has dropped from 45 per cent to 7 per cent since that time. The choice of therapy, whether operative or conservative, was determined by the joint decision of both the internist and the surgeon. Although treatment by conservative methods is certainly of great value, there always remains a category of cases in which medical therapy is helpless but in which radical surgical intervention offers a chance of saving the patient's life and preventing another fatal hemorrhage. Even the devoted followers of the Meulengracht method recognize this fact.

It is generally agreed that operation should not be undertaken in cases of occult hemorrhage, in cases in which manifest hemorrhage does not affect the general condition of the patient in the form of shock or severe anemia, nor in those cases in which bleeding can be checked promptly by medical treatment. There are certain general or special contraindications to any form of surgery, which should also be considered here. Surgery is contraindicated in conditions such as cerebral hemorrhage, severe kidney disease, marked senility, heart failure, and so forth.

The author delineates two groups of cases in which he recommends that operation be considered in order to prevent further hemorrhage:

1. Cases in which the roentgenogram reveals a niche, in which there has been previous perforation, or in which a definite diagnosis of callous ulcer has been made at an earlier date, and which exhibit one of the two following characteristics: (a) serious periodical hemorrhages in the course of treatment with diet, and (b) severe anemia with continuous hemorrhage and decreasing serum protein levels.

2. Cases in which hemorrhage brings the blood levels below the shock threshold and in which it is difficult to raise the blood pressure with transfusions.

Relief from shock is the first step. This is accomplished by means of large blood transfusions, lowering the head of the bed, and the administration of oxygen. Protein infusions may be used when hypoproteinemia is present.

The objective of the operation is exact hemostasis, resection or excision, and the prevention of further hemorrhage. Palliative operations are of no value. Surgery should be undertaken as soon as possible after shock has been treated, to avoid the danger of another hemorrhage. The author uses Billroth's I or II procedure under spinal anesthesia. Repeated blood transfusions to combat the anemia are given postoperatively. The serum protein levels and carbon dioxide level are carefully checked and the parenteral supply of fluid is gauged according to the needs of the patient. Oral feedings are instituted as soon as possible by giving strained foods with a high vitamin and high protein composition, including oral amino acid preparations. The toxic effect of residual blood in the alimentary tract is counteracted by avoiding hypoproteinemia and thereby restoring the intestinal function as quickly as possible. The danger of incomplete healing along the line of suture due to edema of the intestinal wall is obviated by keeping the serum protein level within normal limits at all times.

The following succinct sentences from Bohmansson's article are worthy of quotation: "as a rule the internist prefers to postpone operation as long as possible, while the surgeon favors operating as soon as possible. Therefore, in the interest of the patient, the two, each knowing his own and the other's possibilities as well as limitations, should co-operate and shoulder the responsibility jointly. It would seem that the internist's objective should be not to lose any cases postoperatively because operation is done

too late, while the surgeon's aim should be to operate only in cases where there are vital indications for operation and to be able to justify his decisions against operation by autopsy material from the medical service . . . These objectives are difficult to attain but are well worth the effort."

The results of this program are as follows:

The total mortality for manifest hemorrhage has decreased from 9.1 per cent in 1939 to 5.1 per cent. The number of cases operated upon has decreased from 45 per cent to 7 per cent of the total. The mortality for conservatively treated cases has decreased from 6 to 5 per cent, while the postoperative mortality has dropped from 13 to 5.2 per cent.

HAROLD LAUFMAN, M.D.

**Cummins, G. M., Jr., Grossman, M. I., and Ivy, A. C.: A Study of the Time of "Healing" of Peptic Ulcer in a Series of 69 Cases of Duodenal and Gastric Craters.** *Gastroenterology*, 1946, 7: 20.

The determination of "healing time" of peptic ulcer is important, in a practical sense, for the evaluation of new methods of treatment and for judgment of the efficacy of treatment in an individual case, and it is important, theoretically, for a comparison of the healing power of peptic ulcers in man and in lower animals. A review of the literature reveals that accurate data on the rate of healing are not available. The healing time, judged by the time of disappearance of the crater radiologically, as was done in this series, has its limitations of interpretation. The data on the estimation of the healing time for a series of 63 duodenal and 6 gastric craters are presented. The average "healing time" for the former group was 37 days, and for the latter 42 days, by x-ray. The treatment, time of x-ray examinations, and roentgen studies were standardized as much as possible. A comparison was made of the estimation of healing time by x-ray and gastroscopy in gastric craters. No correlation was found between the healing time and the size of the crater, age of the patient, recurrence, or the duration of symptoms.

Chronic duodenal or gastric ulcers in man usually heal rapidly under conditions of strict medical management. This observation is of great significance in the light of experimental observations on animals, and its implications have hitherto been unrecognized. When the healing time of an experimental excision ulcer of the pyloric or duodenal mucosa of the dog is compared with the usual rate of filling of a crater of a duodenal or gastric ulcer in man under strict medical management, the difference is not striking. Similarly, the healing time of an excision ulcer of the stomach of the rabbit on rough food is comparable to the filling time of the crater of a gastric ulcer in man. There are actually only two differences between the healing of an excision ulcer in the dog and the healing of a "chronic" peptic ulcer in man. One is that in most ulcer patients, favorable conditions are required for prompt healing; the second is that in some ulcer patients the lesion heals very slowly and occasionally perforates or erodes a blood vessel even under favorable conditions. These two factors are related to the striking tendency of peptic ulcer in man to recur after it has healed.

CHARLES BARON, M.D.

**Shapiro, A. L., and Robillard, G. L.: Morphology and Variations of the Duodenal Vasculature; Relationship to the Problems of Leakage from a Postgastrectomy Duodenal Stump, Bleeding Peptic Ulcer, and Injury to the Common Duct.** *Arch. Surg.*, 1946, 52: 571.

After a rather complete review of the literature on methods of closure of the duodenal stump in gastrectomy or pylorectomy, the authors conclude that the most prevalent complication is leakage of the stump. This complication is believed to account for the largest part of the mortality ranging from 2 to 30 per cent, which is reported for this operation. It is noted that the recent literature on techniques of duodenal mobilization prior to closure stresses the necessity of adequate freeing of the duodenum from the pancreas. The authors found only two brief comments on the possibility that this procedure might devascularize the duodenal stump and thus defeat the purpose for which the technique was designed.

In addition to reviewing the descriptive literature on the anatomy of the duodenal vasculature, the authors dissected 62 bodies. The supraduodenal artery was present in 70 per cent of the specimens but was of small size. This vessel is practically always ligated in the course of gastrectomy. In 75 per cent of the cases the large anastomotic arcade between the superior and inferior pancreaticoduodenal vessels, representing a connection of the celiac axis

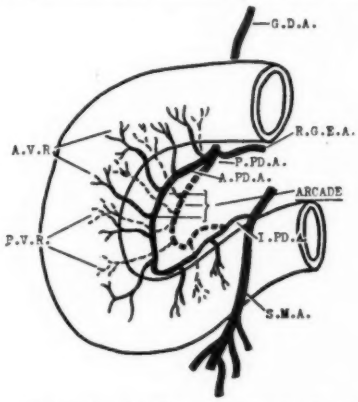



Fig. 1. The peripancreatic pancreaticoduodenal arterial arcade. This was present in about 75 per cent of the cases. G.D.A. indicates the gastroduodenal artery; R.G.E.A., the right gastroepiploic artery; P.PD.A., the posterior pancreaticoduodenal artery; A.PD.A., the anterior pancreaticoduodenal artery; I.PD.A., the inferior pancreaticoduodenal artery; S.M.A., the superior mesenteric artery; A. V.R., the anterior vasa recta, and P.V.R., the posterior vasa recta.

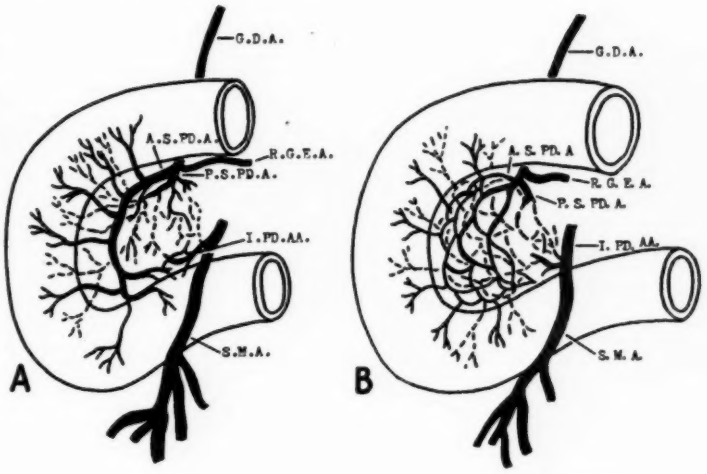



Fig. 2. Common variants in pancreaticoduodenal arterial circulation. Left, Anterior arcade partly complete, with inferior pancreaticoduodenal and posteropancreatic arteries branching (present in about 15 per cent of the cases). Right, Mesenteric arcade and branching pattern (present to some extent in 10 per cent of the cases). G.D.A. indicates the gastroduodenal artery; A.S.-PD.A., the anterior superior pancreaticoduodenal artery; P.S.PD.A., the posterior superior pancreaticoduodenal artery; R.G.E.A., the right gastroepiploic artery; I.PD.AA., the inferior pancreaticoduodenal artery, and S.M.A., the superior mesenteric artery.

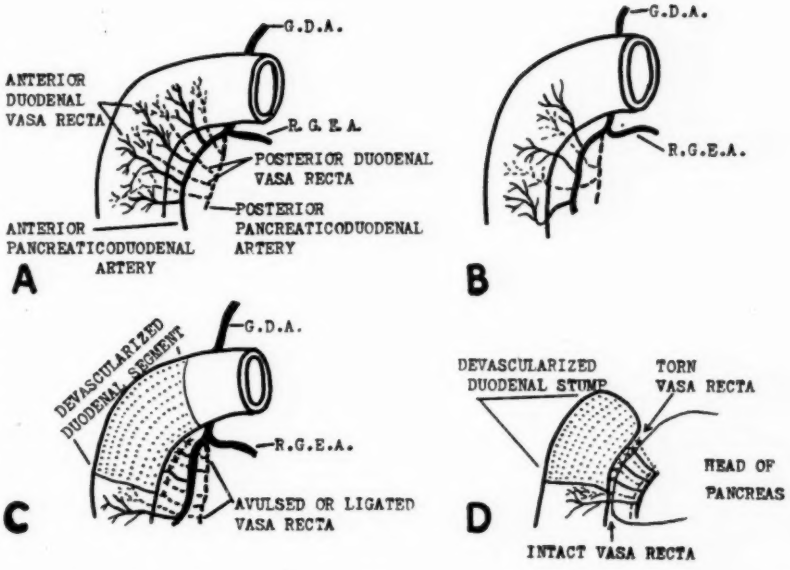



Fig. 3. Variations in configuration of the vasa recta at the region of the duodenal stump. A, Usual pattern. B, Widely spaced "blow-out" pattern. C, Devascularization of the duodenal segment by avulsion of the rami duodenales in separation of the duodenum from the head of the pancreas. D, Extent of devascularized duodenal stump susceptible to ischemic necrosis resulting in many commonly adopted procedures for gastrectomy.

with the superior mesenteric artery, was present (Fig. 1). In 25 per cent of the specimens a complete arcade was absent. In 15 per cent the superior pancreaticoduodenal vessels were well represented but large connections with the inferior pancreaticoduodenal vessels were lacking (Fig. 2, left). In 10 per cent neither the superior nor the inferior pancreaticoduodenal vessels were well developed, and the anastomosis was even less prominent (Fig. 2, right). Anomalies were noted in the origin of the pancreaticoduodenal vessels and were carefully described.

The configuration of the vasa recta of the region of the duodenal stump is described and well illustrated (Fig. 3) to show the effect of ligation of these end arteries during mobilization of the duodenal stump.

The arterial supply of the common bile duct was carefully worked out and illustrated. Injuries to these end vessels might well result in localized ischemic necrosis and later unexpected stricture or fistula.

The necessity for minimal surface exposure

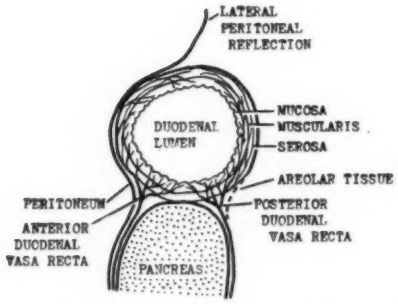



Fig. 4. Schematic cross section of the duodenum and vasa recta, demonstrating the end artery character of the vasa recta. This indicates the absence of major marginal or intramural anastomotic branches.

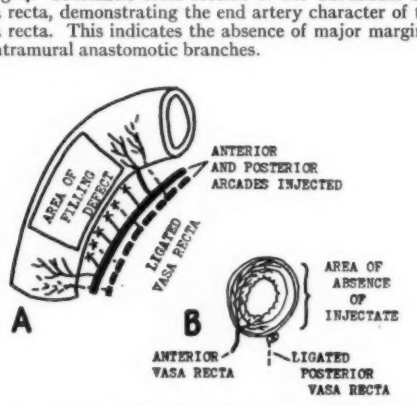



Fig. 5. Nonfilling of ligated vasa recta of the duodenum on injection of cannulated adjacent arcades and vasa recta. Experimental demonstration of the end artery character of the rami duodenales. Left, Longitudinal segment. Right, Cross section.

in operations on this structure is stressed. The circulation of the pancreas is briefly reviewed.

The futility of ligation for the control of hemorrhage from a duodenal ulcer is demonstrated by an illustration which shows that such a procedure is tantamount to complete devascularization of the duodenum and head of the pancreas.

The vasa recta of the duodenum were injected with India ink to show their character as end arteries and the lack of intramural or marginal anastomoses (Figs. 4 and 5). This finding agrees with that of other workers on this subject.

The literature on the safety factor in mesenteric ligation is reviewed.

In conclusion the authors point out the similarity between the incidence of poor anastomosis of the duodenal vessels and that of duodenal leakage. Inversion of the freed duodenum to the point of pancreatic attachment so that intact rami duodenales may provide an intact intestinal circulation is suggested. THOMAS C. DOUGLASS, M.D.

**Cave, W. H.: Duodenal Injuries.** *Am. J. Surg.*, 1946, 72: 26.

The author reports 118 cases of duodenal injury with a mortality of 55.9 per cent in the first 10 days. The site of the wound of entry was fairly consistent, the missile entering the right side of the trunk, either front or back, in 85 per cent of the cases. The patients who died were in a more severe state of shock upon entry than those who recovered. In more than half of the deaths, shock and hemorrhage were the recorded causes of death. Two fatalities resulted from peritonitis due to injuries overlooked at operation; one resulted from a laceration of the common duct and the other from a perforation of the third portion of the duodenum. An important finding was the factor of multiple complicating lesions, which is usually the case in duodenal injuries. In only 2 cases did the damage involve the duodenum alone. It was shown that the mortality was doubled in the presence of 3 complicating injuries and tripled in the presence of 4. In 9 cases there was laceration of the vena cava with 8 deaths. There were 2 cases of portal vein laceration, 2 of laceration of the pancreaticoduodenal artery, and 1 each of laceration of the hepatic and right spermatic artery. All of these cases terminated fatally.

There is a fairly constant wound pattern when the duodenum is injured. For example, if it is a wound of the right upper quadrant that has involved the right kidney, liver, and right colon, injury to the duodenum is quite likely. Pancreatic injury occurred in 9 cases with 8 deaths. Fat necrosis was a marked feature in 1 case, both at operation and necropsy. The gall bladder was injured in 17 cases, and cholecystectomy was necessary in 8. Fifteen patients had associated chest injuries. Damage to the blood supply of the right side of the colon was not an infrequent finding in this series; right colectomy was required in 2 cases.

After repair of the laceration or transection of the duodenum, the site of repair was drained in most of the cases and the peritoneum was closed over the wound. Two duodenal fistulas developed, both occurring in cases of transection of the duodenum with end-to-end anastomosis.

It is obvious from this report that duodenal injuries carry a high mortality, and too much stress cannot be placed upon the advisability of thorough exploration of the duodenum in cases in which there is any possibility that the missile has perforated the retroperitoneal space behind the right colon. Accurate exploration can be done only by reflecting the right colon. HAROLD LAUFMAN, M.D.

**Fallis, L. S., and Warren, K. W.: The Surgical Treatment of Jejunal Ulcer.** *Am. J. Surg.*, 1946, 72: 4.

Some 15 per cent of the patients undergoing gastroenterostomy develop jejunal ulceration. All of the jejunal ulcers appear opposite the stoma or in the efferent loop. A patient who suffers a rupture of a postoperative jejunal ulcer will have had, in many

instances, a former perforation of a gastroduodenal lesion. It would appear that some patients exhibit not only an ulcer forming diathesis, but, equally important, a perforative tendency. The serious complications of jejunal ulcer are hemorrhage, free perforation, and gastrojejunocolic fistula.

Intensive medical therapy is tried in almost every instance of jejunal ulceration, but the response is generally poor and most of the victims are subjected to surgery without undue delay. In addition to the usual preoperative preparation for gastric resection, it is important to cleanse the colon thoroughly because the jejunal ulcer may be adherent to the colon, and this organ may have to be opened in the course of the operation.

The authors' technique consists in detaching the transverse mesocolon from the anastomotic area and then resecting the involved portion of jejunum containing both the anastomotic site and the ulcerated area with its adjacent mesentery. If the previous operation has been a gastroenterostomy, subtotal gastric resection is then performed in the usual manner. Isoperistaltic retrocolic terminolateral gastrojejunostomy is then completed with the anastomosis lying distal to the restored jejunum. Peritoneal soiling is limited by using a closed technique.

HAROLD LAUFMAN, M.D.

**Bray, E.: Invaginations of the Haustra of the Cecum** (Le invaginazioni delle haustra del cieco). *Minerva med.*, Tor., 1946, 1: 213.

The author cites and describes 6 cases of invagination of the haustra of the cecum—the highest number of cases coming under the observation of one man—in the period from 1940 to 1945. Research into the records revealed only 40 cases published up to the present time. The author states that this morbid form apparently escapes the clinical diagnosis, being frequently mistaken for acute appendicitis, and that at operation the rarity of the affection is more apparent than real. He describes the clinical data that may suggest invagination of the haustra and advises that the examiner should keep the condition in mind to avoid its being unrecognized during surgical intervention.

The affection is relatively rare, and must be recognized by the examiner. The author cites 6 cases under his observation admitted as acute appendicitis in which invagination of the cecal haustra was found at operation; the appendix was relatively normal or secondarily involved in edematous pathology.

Various predisposing causes for this condition were given: mobile cecum, ulcerations, foreign bodies, the presence of oxyuris, inflammations and circumscribed spasms, modifications of intestinal peristalsis caused by a parietal lesion, or the beginning of more progressive invaginations.

The symptomatology has few characteristic elements and usually causes the cases to be referred to the surgeon as acute appendicitis. The onset is often sudden with cramplike pain, at times becoming continuous and referred to the epigastrium, periumbilical zone, or right lower quadrant. Vomiting is not constant. The temperature is normal or slightly elevated. The pulse is usually good. The abdomen is generally soft or one may find a certain resistance in the right lower quadrant. Pressure elicits pain at McBurney's point or a bit higher and one may at times palpate a more or less defined and tender mass.

As a rule, the surgeon does not make a preoperative diagnosis, but he may suspect the condition clinically by the rapid appearance in the ileocecal region of a tumefaction of doughy consistency, which is painful and tender to pressure, accompanied by cramplike pain but no fever.

At operation, if the parietal peritoneum appears more edematous than red, if a bloody serous discharge is encountered, and if the cecal wall is edematous, the surgeon is cautioned to expose the cecum and search for its invagination.

At times the roentgenological examination may be of value. The diagnosis is based on a defect in the filling of the cecal wall at the expense of one or more haustra usually on the external cecal border.

G. ALBIN LIVA, M.D.

**Kay, J. H., and Lockwood, J. S.: Experimental Appendical Peritonitis. The Prognostic Significance of Certain Hematological Factors, Especially the Prothrombin Time.** *Surgery*, 1946, 20: 56.

Although there has been a definite reduction in the mortality from appendical peritonitis since the introduction of new chemotherapeutic agents, there has remained considerable uncertainty as to whether the apparent reduction is due to chemotherapy or to improvements in ancillary methods of treatment, such as maintenance of fluid, electrolyte and blood requirements, and intestinal decompression. Because of the importance of peritonitis as a cause of death in penetrating wounds of the abdomen, the problem was of sufficient wartime importance to study the basis of chemotherapy in the light of the new advances in our understanding of the pathogenesis of morbid changes.

The authors produced necrosis of the appendix in dogs by ligature and studied the animals from the standpoint of various chemical and pathological tests. Peritonitis was produced in 91 control animals, with a mortality of 41.7 per cent. The majority of deaths occurred between 24 and 72 hours.

Nonprotein nitrogen levels averaged 36 in the living group of animals and 46 in the dying group. Total protein concentrations showed a fall on the third postoperative day in the surviving animals, coincident with hemodilution. During the acute stage, however, there was no significant difference between these values in the surviving and dying animals. Chloride determinations were done on animals which received intravenous fluids, as well as on those which took fluids by mouth. There was no real correlation between the chloride level and the outcome of the final crisis. Sodium and potassium levels also showed no significant difference between

the two groups. Bacteriological examinations revealed that the pathogenesis occurred with almost equal frequency in the exudates of animals which survived and of those which succumbed. Further tests of the red blood count, white blood count, and hemoglobin showed no differences of significance in the dogs surviving and dying, although these values followed a typical course.

The only significant finding was the observation that blood taken during the crisis of peritonitis did not clot readily, and when it did clot, it was in the nature of a soft thrombus and clot retraction did not occur. Prothrombin time determinations were made at 24, 48, and 72 hour postoperative periods. It appeared that animals whose prothrombin times were consistently normal survived, whereas animals whose prothrombin times were prolonged as much as 2 or 3 seconds at the 24 and 48 hour periods tended to die. An occasional animal in the latter category survived but remained in poor condition until the prothrombin time had returned to normal. Furthermore, there appeared to be a relationship between prolongation of the prothrombin time and the severity of respiratory distress. As a result of this finding, chest roentgenograms were taken at various periods. These indicated that there was a definite association between the onset of pulmonary disease and the development of prolongation in prothrombin time.

The prolongation in prothrombin time appears to be related to the failure of the clotting mechanism in the blood of animals dying of peritonitis and to the occurrence of hemorrhagic changes in the peritoneum, liver, and lungs of many of these animals. Experiments with protamine indicate that it is unlikely that heparin is responsible for this finding. One obvious explanation is the development of severe injury to the liver parenchyma from anoxia or bacterial toxins. It is suggested that this mechanism may be a disturbance in the equilibrium between circulating proteolytic and antiproteolytic factors. The study of the physical properties of blood in peritonitis indicate that the disease may be separated roughly into 4 stages and that these properties tend to shift simultaneously in the changes of the disease from one stage to another. It appears that changes in the prothrombin time not only reflect the various stages of the disease but also seem to be of prognostic value even before the onset of the disease crisis. HAROLD LAUFMAN, M.D.

**Ricketts, W. E., and Palmer, W. L.: Complications of Chronic Nonspecific Ulcerative Colitis.** *Gastroenterology*, 1946, 7: 55.

In a series of 206 cases of chronic nonspecific ulcerative colitis, complications were present in 64 (31.06 per cent). The complications were classified into five groups: (1) those involving the colon itself, (2) those involving adjacent structures, (3) those distant from the colon, (4) complications resulting from deficient nutrition, and (5) a miscellaneous group.

The complications in the first group may be listed as follows: polyps in 21 cases (10.0 per cent), stricture in 8 (3.9 per cent), obstruction in 6 (2.9 per cent), and carcinoma in 3 (1.4 per cent). Hemorrhage occurred quite frequently but there was no fatality from this cause. Ulcerated hemorrhoids were noted in 13 cases (6.8 per cent).

In the second group, internal or external fistulas were found in 9 cases (4.4 per cent). Perforation with peritonitis was observed in 7 (3.4 per cent).

Complications distant from the colon were as follows: lesion of skin and mucosal surface in 22 cases (10.64 per cent), arthritis in 12 (5.82 per cent), venous thrombosis in 4 (1.94 per cent), hepatitis in 1 case (0.48 per cent), and septic infection in 27 cases (13.10 per cent).

Listed among the complications derived from deficient nutrition were malnutrition and avitaminosis, although the incidence and severity of these could not be determined. In a subgroup of 23 children there were 3 cases of infantilism, an incidence of 13.1 per cent. Peripheral neuritis was observed in 3 cases (1.45 per cent).

A miscellaneous group of complications included several conditions, viz., pleuritis in 2 cases (0.97 per cent), and endocarditis in 2 cases (0.94 per cent).

CHARLES BARON, M.D.

**Silani, C.: Suppurative Perisigmoiditis** (Sulle perisigmoiditi suppurate). *Arch. ital. chir.*, 1945, 67: 120.

Four cases of suppurative perisigmoiditis are reported by the author; 3 of the patients were adult males and 1 was a 9 year old girl. In 3 cases an abscess formed in the anteroinferior portion of the left iliac fossa and in 1 case the abscess was located in the retroiliac region. In 3 cases an incision and drainage of the abscess were done according to Roux's method while in the fourth case the pus drained spontaneously through the intestinal tract. All 4 patients recovered. The condition may be acute or chronic. The acute type may assume a plastic or suppurative form and the latter may or may not cause a perforation. Two types of chronic perisigmoiditis may be distinguished: stenosing, plastic, and pseudotumoral.

The condition may follow a trauma or may be the sequel of diverticula.

Pain, fever, and symptoms of peritoneal irritation are usually present. Differential diagnosis must be made from suppuration originating in the female genital organs, tuberculous peritonitis, appendicitis, inflammation of the psoas muscle, and perinephric abscess.

Roentgenological examination is essential for the diagnosis. Perisigmoiditis creates an image of intestinal stenosis with a smooth outline generally; sometimes the image simulates that of a tumor.

The prognosis is usually favorable. External or internal fistulas frequently form and establish communication with the intestines, urinary bladder, or vagina.

The treatment is surgical. A simple incision and drainage is sufficient unless perforation of a diverticulum is present, when resection of a portion of the sigmoid may be required. JOSEPH K. NARAT, M.D.

**Torre, J., and Camposa, E.: Surgical Treatment of Cancer of the Rectum and Sigmoid** (Tratamiento quirúrgico del cáncer del recto y sigmoide). *Arch. cubanos cancerol.*, 1946, 5: 52.

The authors advocate a 1 stage abdominoperineal operation for cancer of the rectosigmoid region. They prefer an artificial anus in the iliac region to perineal colostomy. Urographic studies should be made in every case before the operation is performed because they may reveal a double ureter or another anomaly of the urinary tract.

In obstructive cases Devine colostomy is recommended.

The authors stress the importance of proper preoperative treatment.

One operative team is sufficient. The perineal resection requires little time if the abdominal dissection has been done in the proper manner.

The operation is usually performed by the authors under spinal pantocain anesthesia and a blood transfusion is given during the procedure.

The resection should include the sigmoid, rectum, anus with its sphincter, levator ani, ischiorectal fat, mesosigmoid, and pelvic peritoneum. The preoperative introduction of ureteral catheters is highly recommended because it contributes to the avoidance of lesions of the ureters.

It is important to suture the free border of the mesosigmoid to the abdominal wall to avoid the possibility of a hernia in the region of the colostomy.

Sim's position is recommended by the authors for the perineal resection. JOSEPH K. NARAT, M.D.

**Yódice, A. R.: Surgical Treatment of Cancer of the Rectum** (Tratamiento quirúrgico de cáncer del recto). *Arch. Soc. cir. hosp.*, Santiago, 1946, 16: 123.

This article is an excellent résumé of the surgical management of rectal cancer. It presents the history of the operative treatment and the various techniques involved, and relates the historical development of the three approaches—the perineal, abdominoperineal, and abdominal—employed in surgery for carcinoma of the lower bowel. Palliative treatment is reviewed under the title of "colostomy," which appears to have been used exclusively in the beginning and is retained to the present day as a preparatory step to any definitive surgery for bowel cancer.

The historical summary may be appreciated from the following outline:

1. Palliative treatment—colostomy: cecostomy, Pillore, 1776; lumbar colostomy, Amussat, 1839; and abdominal colostomy, Allingham, 1875.

2. Curative treatment—resection via peineum, Koenig, 1882, with previous abdominal colostomy. Resection: amputation of rectum and adjacent tissue, Lisfranc, 1826; sacral resection, opening through peritoneum and sacral anus, Bardenheuer, 1880, and Kraske, 1885; perineal resection, removing stump of sigmoid after abdominal colostomy, Lockhart-Mummery, 1908. Resection and anastomosis: end-to-end anastomosis, Kocher, 1875: via vagina, Desquins, 1890, and Murphy-Tutlle, 1900; via anterior perineal route, Cuneo, 1908; and by means of a glass tube, Lockhart-Mummery, 1908. Also anastomosis at different times, Mikulicz Kuttner, 1910. Resection from below: through the anus, preserving the sphincter, Dieffenbach, 1845; and via the terminal rectum: "pull-through" or invagination, Hochenegg, 1888.

Curative treatment—resection exclusively through abdomen. Resection and anastomosis in different stages: exteriorization and double-barreled colostomy, Block, 1892, and Mikulicz, 1902; previous rectal mobilization, Schoeffer, 1903, and single-stage resection, with double-barreled colostomy, Paul, 1895. Resection and anastomosis, per primam: open method, Reybard, 1833, and Dixon, with colostomy preceding; closed, or aseptic method, Soulingoux, 1896; and Wangensteen, without previous colostomy. Resection and definitive abdominal colostomy: closure of distal stump, Hartmann, 1923.

Curative treatment—resection via abdominoperineal route. With definitive abdominal colostomy: Single-stage—Miles, 1908—extensive amputation of the rectum and mesosigmoid, and Gay Turner, 1934—preceded by perineal resection. Two-stage—Coffey, 1915—(1) definitive abdominal colostomy and invagination of inferior barrel for rectal traction, and (2) perineal resection; D. Jones, 1915—(1) mobilization of sigmoid and pelvic peritonealization with abdominal sigmoidostomy, superficial, and (2) perineal amputation; Turner and Rankin, 1931—(1) definitive abdominal colostomy with closure of distal barrel, and (2) perineoabdominal extirpation; Lahey, 1930—(1) definitive abdominal colostomy with division and separation of the barrels; and (2) extirpation, abdominoperineal.

Also, resection and low end-canal—Maunssell, 1892—mobilization, abdominal, after Diffenbach, and low perineal, after Hochenegg; and resection and end-to-end anastomosis—Volkman and Kocher—abdominal mobilization and perineal anastomosis.

Significant factors which must be considered in any surgery for carcinoma of the large bowel are the patient's age, length of illness, psychological background, probable surgical reaction, location of the tumor, and social standing of the patient.

The author recapitulates the general knowledge regarding the surgical anatomy associated with cancer of the lower bowel, presenting numerous drawings. He believes that the importance of the "critical point of Sudeck" is exaggerated. He thinks that the danger point is farther to the left and designates it as "the dangerous sigmoidal point."

Operability depends upon the age of the lesion and the general condition of the patient at the time of first consultation, and according to the author's experience as many as 85 per cent of the patients are operable.

The mortality depends upon the technique employed. In abdominoperineal resection it is between 10 and 12 per cent, but since the introduction of chemotherapy, this figure has been reduced to 7 per

cent inasmuch as peritonitis is the principal cause of death.

Operation for cancer of the lower bowel requires assiduous, well planned preoperative care, insistence upon the fundamentals of surgery during the operation, and intelligent postoperative therapy.

Preoperative care must include the correction of constipation, and disinfection of the rectum and colon as far as possible. The patient should be put in biological balance, if need be with intravenous infusions, blood transfusions, and a selected dietary regimen. Twenty-four hours preceding surgery, a Miller-Abbott tube should be inserted.

Continuous spinal anesthesia is the anesthesia of choice with Yodice, and postoperative therapy includes the judicious use of fluids, plasma, and blood.

Steps in the various operative procedures are depicted by serial illustrations which show many operative methods employed in cancer of the lower bowel. STEPHEN A. ZIEMAN, M.D.

## LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

**Villaça, J., Falci, A., and Duarte, M.: Nonparasitic Cysts of the Liver** (Cistos não parasitários do figado). *Rev. brasil. med.*, 1945, 2: 658.

Nonparasitic cysts of the liver are very rare. Up to 1943 about 200 cases had been collected. They may be unilocular or multilocular, solitary or multiple, and are often accompanied by polycystic kidneys. They vary in size from that of a pinhead to that of an adult's head. In most cases they cause few symptoms unless they become large enough to cause pressure on the neighboring organs. If they are in the pedicle of the liver they may exert pressure on it and cause ascites or icterus. The color of the cyst contents may be yellow, green, red, or opalescent. The fact that these cysts frequently occur in association with cysts of the ovary, spleen, or pancreas or that they sometimes coexist with meningocele or polydactylism suggests a congenital origin. Familial occurrence is rare but Bunting has reported a case in 2 brothers, associated with polycystic kidneys. The patients are generally in good general health as the tumors are benign, but late in the disease there is a depression of the general health with emaciation, profound malnutrition, and anemia.

The authors describe 5 cases of their own, 2 in males and 3 in females. The diagnosis of these cysts is generally made only at operation, as it was in the authors' cases. In the first case the preoperative diagnosis was stenosis of the pylorus; in the second, hydatid cyst of the liver; in the third, the beginning of the menopause possibly associated with appendicitis or prolapsed kidney; in the fourth, tumor of the pancreas or liver or encysted ascites; and in the fifth, floating kidney, cholecystitis, or stones. Marsupialization was performed in 2 cases of solitary cyst, and extirpation of the cyst in 1 case. Recovery was uneventful in all of the cases.

AUDREY G. MORGAN, M.D.

**D'Errico, G.: Cavernomas of the Liver; 2 Cases Treated by Hepatic Resection** (I cavernomi del fegato; 2 casi operati di resezione epatica). *Riforma med.*, 1946, 60: 168.

Two cases of cavernoma of the liver are reported; both occurred in women. In the first case there were occasional attacks suggesting an acute abdominal condition, a subicteric color of the skin, bile in the urine, high blood pressure (185-85 mm. Hg.), and an indistinct systolic heart beat both over the apex and over the base of the aorta.

Laparotomy disclosed, in addition to a somewhat enlarged gall bladder, an orange sized, sessile, rather sharply delimited tumor, which was nodular and of a somewhat darker color than the liver tissue itself; it was situated on the under surface of the right hepatic lobe. U-sutures of heavy catgut were placed around the mass and it was excised, the resultant raw surfaces being covered by an epiploic flap and by the gall bladder. The histological diagnosis was angioma cavernosum.

The patient died of acute cardiac insufficiency on the fourth postoperative day and autopsy disclosed, in addition to the usual findings in heart failure and postoperative paralytic ileus, the enlargement of the gall bladder already noted and also a moderate degree of intrahepatic cholangiectasia suggesting chronic bile stasis.

The second patient was apparently in robust health. Her only trouble was a tumor mass in the abdomen which grew in a few months from the size of an orange to that of an adult head. Physical and laboratory methods of examination showed the tumor to have pushed the lesser curvature of the stomach to the left and downward, and the spleen upward, to lie in front of the colon. The mass was freely moveable with respiration and of a rather firm consistency with an irregular surface.

At laparotomy the dark red neoplasm was found to be attached to the under surface of the left lobe of the liver. Interlocking sutures were used to isolate the area of the tumor attachment and histological examination of the extirpated mass disclosed an angioma cavernosum. In removing this tumor a slight injury to its surface was incurred which resulted in bleeding that could be controlled only by extirpation of the neoplasm itself.

The author wishes to emphasize that this accident shows the danger to the patient of even insignificant abdominal trauma and the importance of early surgical treatment of the condition.

JOHN W. BRENNAN, M.D.

**D'Errico, G.: Hepatic Cavernoma from the Surgical Standpoint. Critical Review of the Literature; 71 Operated Cases** (I cavernomi del fegato di interesse chirurgico. Rivista critica della letteratura; 71 casi operati). *Gior. ital. chir.*, 1946, 2: 267.

None of the statistical compilations from the medical literature of hepatic cavernoma seem to have been complete. A careful study of the literature up to the end of 1940 has disclosed 69 cases of hepatic

cavernoma which have undergone operation. To this number the author adds the 2 cases of his own, which were reported in *Riforma Medica* (1946, 60: 168).

On examining the entire material of 71 cases it is seen that in 81 per cent a tumefaction could be palpated in the abdomen, and in a few instances a connection with the liver was indicated, but in the majority no connection seemed possible. Localization showed a preference for the left lobe, while in most other conditions the right lobe is involved. X-ray examination—which was done in only 6 of these patients—has proved of no value in locating the disease. A "murmur" over the tumor and changes in size have been given as the basis for diagnosis in only 2 cases; however, one author noted only the absence of these characteristics of cavernoma. The symptoms of abdominal pains and digestive disturbances, and even the rupture of the cavernoma have never led to the correct diagnosis; the usual condition suspected is an acute abdominal condition, with subsequent operative or autopsy clarification of the condition. Although the female sex predominates (89.2 per cent) among the 56 patients of whom the sex was given, and although these tumors have come to operation predominantly in the years of sexual activity, pregnancy has not proved to be a clear cut factor in their etiology or development.

The prognosis is less favorable than for cases of benign tumors in general because of the complications (of which the gravest is rupture of the tumor itself—spontaneously in 7 cases, and during operation in 6), and because the location of the tumor renders excision difficult or impossible. In 1 case (Pozzi) rupture occurred following operation, which made a total of 14 cases of rupture among which only 3 patients were saved. In 1 of the author's patients the tumor was injured at operation and the resulting hemorrhage could be controlled only by excision of the mass. Even this discussion of the prognosis does not give a true picture of the gravity of the condition since only the cases of patients operated upon are here recorded.

In 1 of the 7 cases of spontaneous rupture, excision was done and in 6 direct hemostasis was attempted; there was only 1 recovery. In 5 of the 6 cases in which rupture occurred during the operation direct hemostasis was attempted with death of the patient in every instance, and in the remaining case (the author's second) the patient was saved by hepatic resection.

Other methods of treatment than those cited have been: roentgen therapy, which resulted in a marked diminution of the tumor mass in 2 instances; injection of a sclerosing liquid(varicocidin) in 1 case; and tamponade of the nonexcisable tumor with gauze impregnated with vivocoll (coagulating animal plasma). These offer encouraging prospects for the future, but the author is of the opinion that for the present, hepatic resection remains the treatment of choice in the majority of cases of hepatic carcinoma.

JOHN W. BRENNAN, M.D.

**Mirizzi, P. L., Suárez, C. V., Saravia, E. C., San Martin, A. F., and Others: Accidental Section of the Hepatic Ducts; Ligation of the Right Duct and Anastomosis of the Left to the Common Duct over a Vitallium Tube** (Sección accidental de las ramas del hepático; ligadura de la derecha y anastomosis de la izquierda al hepático común sobre tubos de vitallium). *Bol. Acad. argent. cir.*, 1946, 30: 117, 204.

A 31 year old woman had been suffering for 4 months from typical attacks of gallstone colic. The gall bladder could not be visualized roentgenologically. At operation a Mayo incision was made under spinal anesthesia with percaine (7½ mgm.) and an enormously thickened, adherent gall bladder containing numerous stones—one of which was wedged into the bladder neck—was removed in the retrograde direction. What appeared to be a shortened cystic duct was doubly ligated and sectioned. It was then noted that the hepatic duct had been ligated and sectioned at the level of the confluence of the two rami, and Bazterrica and Medrano were called in on the case to reconstruct the bile passages. An attempt was made with a Y-tube of vitallium; however, an assistant accidentally tore the right hepatic duct across which rendered its repair impossible. The torn duct was therefore ligated and the left hepatic duct was anastomosed to the common duct by a single vitallium tube bent at an angle of 175 degrees.

In the postoperative course there was an immediate elevation of the level of bilirubin, which reached a height of 25 mgm. per 1,000 c.c. of blood on the second day, and then dropped to 16 mgm. from on the seventh to the twenty-first day, to 12 mgm. on the thirty-seventh day, and, finally, to 0 on the fifty-eighth day. Except for this sign of biliary obstruction the postoperative course of the patient was perfectly normal. Considerable bilirrhagia was noted but the authors believe that this leakage came from the anastomosis rather than from the ligated duct.

The authors conclude that the case confirms the experimental hypothesis of the innocuity of ligation of one of the hepatic ducts. However, they do not think that the results obtained justify the deliberate and intentional interruption of any part of the bile passages.

In the discussion SAN MARTIN refuses to admit that the normal right hepatic duct was ligated and prefers to believe that the vessel ligated was a branch of a double duct or actually an accessory right hepatic bile duct, which he asserts has been reported by Descomps in 10 per cent of his cases.

However, SUÁREZ believes that although the roentgenogram does appear to show that the vitallium tube might be projecting into a right hepatic duct instead of a left one, and although the cholangiographic examination with abrodil cannot be repeated because of the fact that the biliary fistula has completely closed, a careful study of the details of the intervention makes it possible to admit that the theory of Bazterrica is correct. This belief rests

upon the fact that this surgeon is a master of his craft, and has worked for 18 years with another great master, Bengolea. He believes that his affirmation can be accepted that he actually had under his hands the hepatic hilus which was totally separated from the common duct; that the possibility of suppressing a great part of the biliary secretion by ligating one or more of the hepatic ducts has been abundantly demonstrated experimentally; that the compensatory hypertrophy of the remaining hepatic tissues is known to be extraordinary; and that the patient's ability to live comfortably with total suppression of the external secretion of the pancreas should suggest the same possibility with reference to the hepatic gland. This discussor cites 20 instances observed since 1926 in which such an injury to the main bile ducts occurred. He cites an instance in which the external secretion of the right lobe of the liver had been suppressed, as demonstrated by cholangiography, and, finally, he demonstrates roentgenograms showing such anomalies of the biliary tract in which extirpation of the gall bladder could hardly result in other than injury to the right, or possibly to both hepatic ducts.

IVANISSEVICH declares that the cholecystectomy from the fundus to the neck of the gall bladder is less liable to such accidents as are here discussed; that in doubtful cases a portion of the bladder should be left intact rather than risk such an event; and that a cholecystectomy should be instituted as soon as the diagnosis of gallstones is made.

CAEIRO and PASMANN believe that neither type of extirpation of the gall bladder, from the fundus to the neck or the retrograde type can be shown to be superior to the other, and that the best method will be determined by the local conditions found at operation. Injury to the bile passages will occur with either method. Pasmann points out that the neck to fundus type is relatively bloodless because of initial ligation of the cystic artery, while the fundus to neck type is bloody. However, he has obtained good results from the injection of adrenalin solution under the bladder bed before he attempted its dissection. This method he ascribes to a suggestion made to him by Villegas.

JOHN W. BRENNAN, M.D.

**Royer, M., Solari, A. V., and García, M. L.: Nonsurgical Cholangiography in Vesicular Lithiasis** (La colangiografía no quirúrgica en la litiasis vesicular). *Arch. argent. enferm. ap. digest.*, 1946, 21: 36.

Royer, Solari, and García performed nonsurgical cholangiography for the exploration of the intrahepatic and extrahepatic biliary passages in 1940, and presented their article in November, 1941. In August, 1941 Lee of Philadelphia presented a procedure which he uses to visualize the biliary tracts by injecting a radio-opaque substance into the gall bladder during peritoneoscopy, but there are no published results up to the present. Royer has confirmed that the work was done simultaneously and independently in Philadelphia and Buenos Aires. After studying the paper of Lee, Royer found that the idea was the same; however, the authors are more advanced as Lee visualizes only the gall bladder and, at times, the cystic duct rather poorly. Lee agreed verbally to use their technique. Royer *et al*, are the only ones who have used and published the method showing an integral vision of the whole biliary tree, the physiology of the biliary ducts, and roentgenograms of stones in the gall bladder and biliary passages, and of cholangitis. Mirizzi and Urrutia have compared surgical and nonsurgical cholangiography rather inadequately.

For the following reasons, the authors' method is more efficient than other methods of operative or postoperative cholangiography: previous laparotomy is unnecessary, and peritoneoscopy is actually harmless compared to surgery; a study of the biliary passages, approximating normal, may be made, no morphine or general anesthesia being necessary; there is no shock due to peritoneal trauma and therefore the normal physiology of the biliary tract can be observed; this method allows visualization of the gall bladder, which is not possible with other methods of cholangiography; and, last, a study of the cystic, hepatic, and common bile ducts may be made in the same manner as in other cholangiographies.

The method cannot be used in all cases and presents the following difficulties: if a very high or very low point is necessary for injection of the gall bladder, the immediate selection of another site is imperative or the injection must be postponed for another sitting; injection into a much diseased and damaged gall bladder is contraindicated because of the danger of subsequent bile peritonitis; and if the gall bladder is scleroatrophic in general, it cannot be observed or, if it can be examined, injection is impossible because of nonexistent vesicular light reflex. However, these conditions are of little importance as both are indications for operation. Adhesions around the gall bladder, as in the omentum or colon, prevent visualization and injection. In 28 cases the authors failed to inject the gall bladder.

Twenty-seven cases were diagnosed by this method and the condition diagnosed was confirmed by operation. The method is utilized in cases of obstructed gall bladder, that is, when cholecystography is negative and there is no bile on duodenal sounding. Cholecystolithiasis is most probably the cause of the obstruction if in spite of the negative findings there are subjective symptoms of hepatic colic. These symptoms may be simulated by other processes, such as acute and chronic cholecystitis, external compression of the cystic duct, and dyskinesia of the biliary passages.

Nonsurgical cholangiography makes an accurate diagnosis of these conditions, establishing the prognosis and indicating the method of treatment, whether medical or surgical. In all cases in which cholecystography and duodenal sounding do not clear the diagnosis, the author's method will enable

one to diagnose the obstructed gall bladder easily. Also, the presence or absence of stones can be determined on visualization of the biliary tract. When the cystic duct is free, it is important to investigate the organic function of the gall bladder. A peritoneoscopy presupposes the examination of the gall bladder walls (fundus) and the form of this organ before an attempt is made to determine the normal or abnormal anatomic condition and complement this examination by provoking the evacuation of the gall bladder to see its functional state. Before, in cases of nonobstructed gall bladder with negative cholecystography and good vesicular evacuation after duodenal sounding, the diagnosis of cholelithiasis offered difficulties, but it is precisely in these cases that the authors' method confirms and assures decisive results. The value of the method diminishes relatively in positive cholecystographies, although a sure diagnosis of cholecystolithiasis can be established and better visualization of the biliary passages can be obtained, especially with regard to existing calculi in the biliary duct. It is important to utilize the various positions in the roentgen examinations; in a doubtful diagnosis of cholecystolithiasis in the ventral view, a dorsal view should be taken, or vice versa. Also, the motility of the stones may be observed in the different positions. The standing position suggested by Akerlund may be applied to cases in which the visualization of stones in the gall bladder is difficult in the supine or dorsal position.

Among the advantages of the authors' method is the easy and effective diagnosis of cholecystolithiasis as the stone shadows appear distinct and intense. The length and integrity of the cystic duct may be observed, which fact is much appreciated by the surgeon as it indicates the technical difficulties he will encounter but which cannot be deduced from the roentgen pictures. If the common bile duct is visualized up to the sphincter of Oddi, exploration of these ducts during operation will be unnecessary.

There are some dangers that should be emphasized. To date, 88 cholangiographies have been registered with no mortality nor infection, except in 3 patients who had been operated upon from 8 to 10 days after cholangiography. Omental adhesions were seen at the point of vesicular puncture, but in the other patients the point could not be ascertained. Only in 1 case with bile leakage, in which complications were feared, the patient had intense pain in the evening and on examination the next morning the bile leakage from the incision made for peritoneoscopy was revealed. With a larger cannula, peritoneal examination showed no irritation. During the operation peritonitis without bile was found, the liver and gall bladder were normal, and the point of puncture was hard to find. After cholecystostomy, the patient recovered uneventfully.

Two cases of erroneous interpretation were registered: in the 144th observation a diagnosis of stone was made but the patient was operated upon 9 days after cholangiography and no stone nor point of puncture was found in the gall bladder; and in the 169th observation the roentgen picture seemed to show 3 stones at the neck of the bladder, but nothing was encountered at the operation.

A. B. Vicencio, M.D.

# GYNECOLOGY

## UTERUS

**Pavoni, A.: The Innervation of the Uterus** (L'innervazione dell'utero). *Riv. ital. gin.*, 1944, 27: 5.

The author gives a detailed review of the clinical and experimental work that has been done on the innervation of the uterus. Some authors have shown in animal experiments that the pregnant uterus contracts more or less regularly even when it has been completely isolated from the central nervous system by section of the spinal cord. Clinically, spinal anesthesia isolates the uterus from the central nervous system and leaves it to be regulated by the autonomous ganglionic system of the organ itself. Under these circumstances the body of the uterus shows an increase of tonus and decrease of contractions. While this shows that the spine has an inhibiting or regulatory action on tonus and a simulating action on contractions, it does not show whether the regulatory fibers run in the sympathetic or parasympathetic system. Moreover, the cervix, unlike the body of the uterus, does not show increased tonus when cut off from its spinal connections but can be dilated easily. This, however, does not prove that there is a sympathetic control for one of these parts of the organ and a parasympathetic control for the other. The most that can be said is that the autonomous ganglionic regulatory system of the uterus controls the tonus of the body while that of the cervix is regulated by stimuli from the uterus itself, although it is impossible to say whether the motor and sensory impulses run through sympathetic or parasympathetic fibers.

The sympathetic fibers to the uterus come from the lumbar and sacral tracts; it is possible, however, that some of the branches of the thoracicoabdominal sympathetic may reach the adnexa through the uteroovarian plexus. The parasympathetic fibers run for the most part in the pelvic nerve while the vagus plays little part in the innervation of the uterus. It is probable that, as for other abdominal organs, parasympathetic fibers of spinal origin reach the uterus through the posterior roots, and that their spinal center is in the intermediate zone of the posterior horn.

The adnexa apparently receive fibers from the phrenic nerve also. There are more or less free anastomoses between the fibers of the hypogastric plexus and those of the internal spermatic plexus. The many sympathetic and parasympathetic fibers in the uterine musculature divide into delicate fibrils and run in all directions, being distributed to all parts of the organ. It is not certain whether, as in other hollow organs, there are intramural nerve cells or ganglia which constitute a true autonomous nervous system, but it is probable that the fundamental plexus of Boecke and the terminal reticulum of Stoehr act as an automotive system. In any case the many ganglia scattered along the extrauterine course of the sympathetic fibers are of great value in this respect.

The greater part of the efferent sensory fibers follow the sympathetic, of which the spinal centers are in the first and second lumbar and second and fourth sacral segments. Visceral pain is transmitted through these. The afferent branches for the uterus have motor, inhibitory, and trophic fibers, but it has been impossible either from clinical or clinicophysiological data to determine whether they are localized in the sympathetic or parasympathetic nerves.

While the pregnant uterus when separated from its connection with the central nervous system is capable of expelling its contents, the extrinsic innervation certainly has a function of co-ordination and regulation.

Many important problems in regard to the innervation of the uterus still remain to be settled and until they are settled it will be impossible to establish definitely the mechanism of the various functions of the uterus during and in the absence of pregnancy.

AUDREY G. MORGAN, M.D.

**Gianaroli, L.: Necrosis of Fibromas and Polyps of the Uterus** (La necrosi dei fibromi e polipi uterini). *Riv. ital. gin.*, 1944, 27: 277.

Fibromas and polyps of the uterus frequently undergo necrosis because of pressure of the fibrous tissue on the muscle fibers and blood vessels, followed frequently by secondary infection. Necrosis occurs particularly frequently in solitary nodules of medium size. There are various types of necrosis, the aseptic and soft types being most frequent, followed in frequency by the red, calcareous, and cystic necroses; the septic, myxomatous, and hyaline forms are rarer. Red necrosis is characterized by hemoglobin imbibition caused by extravasations of blood and is followed by necrobiotic degeneration.

The author presents statistics from other authorities and discusses 111 cases of his own which were seen in 10 years at the Obstetrical and Gynecological Clinic of Bologna. Among a total of 6,572 gynecological examinations there were 893 cases of fibromas or polyps in a good state of preservation and 111 which had undergone necrosis. The average age of the patients in his group was 43 years. The most frequent symptom for which the patients came to the clinic was abnormal hemorrhage. The patients also presented pain, rise of temperature, a feeling of rapid increase in the size of the tumor, and amenorrhea.

This complication of fibroma is most frequent during pregnancy and as the patient approaches the menopause. In about half of the cases the heart is more or less seriously affected but the blood pressure remains normal; azotemia shows somewhat higher values than normal. Serious kidney lesions are rare, but slight bladder disturbances are not in-

frequent. The symptoms, insofar as they differ from those of ordinary fibromas or polyps, are doubtless caused by the absorption of toxic substances from the tumor.

Treatment consists of removal of the uterus. It is a mistake to rely on conservative measures in the hope of overcoming the symptoms. Among the author's cases there were 6 deaths, a percentage of 5.4 as compared with 1.1 among cases of tumors which have not undergone necrosis.

Four of the deaths were due to circulatory collapse; 1 was due to bronchopneumonia, and 1 to acute purulent peritonitis. In 60 cases the postoperative course was absolutely normal while in the others it was complicated by fever for varying periods of time or by circulatory collapse.

AUDREY G. MORGAN, M.D.

**Marshall, W., Holloway, A. L., Irby, L. E., and Peacock, C.: Inspissated Blood and the Growth of Fibromatous Uterine Tumors. Preliminary Report.** *Am. J. Surg.*, 1946, 72: 57.

The author, after discussing some of the hypotheses concerning the cause of uterine fibroids, proposes a theory of "positive chemotropism" to account for their origin. He had noted, after repeated intradermal injections of blood serum into his thigh, that a large fibromatous area developed. He suggests that in the presence of chronic uterine infection blood is forced into the uterine stroma by the contractions of the uterus during menstruation. The blood becomes inspissated and attracts fibroblasts to the traumatized areas; when the fibroblasts begin to grow the foundation of a tumor is laid.

Concerning the experimental production of fibrous tumors in animals by estrogenic stimulation, he suggests that the increased blood supply may produce minute hemorrhages which are followed by fibroplasia. The injection of blood serum into one uterine horn and saline solution into the other in a young dog failed to produce tumor formation.

J. ROBERT WILLSON, M.D.

## ADNEXAL AND PERIUTERINE CONDITIONS

**Zuckermann, C.: Torsion of the Fallopian Tube** (Volvulus salpingiano). *Rev. mex. cir.*, 1946, 14: 35.

The author presents a case of torsion of the fallopian tube, the third one he has seen in 20 years. This condition is rare because of the fact that the mesentery of the tubes is broad and short. So far, there are only about 300 cases of this condition on record. The patient was a 23 year old nullipara who came with the complaints of severe lower abdominal pain and frequent vomiting of 24 hours' duration. The menstrual history was irregular with the last menses occurring 10 days before the onset of the present illness. She also complained of a white vaginal discharge. The pulse, temperature, and blood pressure were all normal. All laboratory examinations revealed normal values. The pertinent findings were as follows: marked lower abdominal pain, tenderness over the suprapubic and both iliac regions, slight enlargement of the uterus and both tubes, and marked tenderness of the right adnexa. Because of the severe pain, an exploratory laparotomy was done; the following operative findings were noted: hematosalpinx of the right tube with torsion of its mesentery, imminent perforation of the wall of the tube, ovarian cysts about the size of an orange on the right side, hydrosalpinx of the left tube, and chronic appendicitis with numerous adhesions.

The right tube and ovary, and the left tube and the appendix were removed. The abdomen was closed without a drain. The patient made an uneventful recovery. Macroscopic findings showed that the left tube was filled with serofibrinous exudate, the mass being located at the distal two-thirds of the tube; it had the appearance of a neoplasm. The right tube was markedly engorged with blood. The cyst contained sebaceous fluid and some hair.

The pathological diagnosis was dermoid cyst of the right ovary and hematosalpinx with torsion on the right side.

The mechanism underlying the pathology was believed to be a hydrosalpinx which later developed into a hematosalpinx because of torsion of the mesentery. Practically all the cases of torsion of the tube recorded revealed an abnormally long tube and as a consequence, a long mesosalpinx. There was in almost all of the cases an accompanying ovarian cyst.

The author also reports a case of torsion of a normal tube. This occurred in a woman who was hysterectomized several years previously. He then cites the literature concerning torsion of the fallopian tube. In conclusion, he suggests that this condition be considered in cases of acute abdominal conditions, especially when all other conditions have been ruled out.

SALVADOR S. TRINIDAD, M.D.

**Rojas, D. A.: Ovarian Dysgerminoma** (Disgerminoma del ovario). *Bol. Soc. obst. gin. B. Aires*, 1946, 25: 33.

Rojas reports 4 cases of ovarian dysgerminoma, 3 observed in women less than 20 years of age and 1 case in a woman 26 years old. The menstruation was normal in all except 1 who started menstruating at the age of 9. In the last patient there were 2 pregnancies; the first ended at 7 months with the birth of a child who died 19 days later. The second pregnancy ended in a dystocic delivery at the end of 9 months. The other 3 patients were virgins. The size of the tumor was that of the head of a fetus or of an adult in 3 cases and in the fourth case it was so large that it filled practically all of the pelvis and abdomen. In 2 cases the tumor was rotated and pathological evidence of defective irrigation could be found.

All of these cases have had a very favorable benign course and 2 have been followed up for nearly 5 years. In 3 cases a subtotal hysterectomy with extirpation of the adnexa was done and in 1 case only extirpation of the diseased ovary was done.

WILLIAM E. RICKETTS, M.D.

## EXTERNAL GENITALIA

**De Giorgi, L.: Sudoriparous Adenoma of the Female Genitalia** (L'adenoma sudoriparo dei genitali esterni femminili). *Arch. ostet. gin.*, 1946, 51: 119.

The author criticizes the usually accepted classification of sudoriporous adenomas of the female genitalia on the ground that morphological and etiological factors are mixed in them. These tumors can all be grouped as sudoriparous adenomas of the external female genitalia, no complicated subdivisions being necessary. They are located chiefly on the labia majora, are the size of a pea to that of a filbert, generally solitary, rarely multiple, and only occasionally bilateral. They are subcutaneous, round or oval, or rarely in the form of a polyp with a broad base or pediculated. They have a connective tissue capsule and are freely movable on the underlying tissues but intimately adherent to the skin. They are always benign and do not undergo malignant degeneration.

A case is described in a woman of 47, and illustrated with photomicrographs of the histological findings. Some years before she had noticed a swelling the size of a small bean in the sulcus between the lesser and greater labia on the left side which had increased in size since. The tumor was removed under local anesthesia. It was made up for the most part of tubules and gland acini with papillomatous and cystic areas in which the epithelium was cubical, spindle shaped, and cylindrical in a double layer bounded by a basal elastic membrane. The picture was obviously that of a tubular adenoma and the presence of the basal membrane and the papillomatous and cystic components showed that it was sudoriparous in origin. AUDREY G. MORGAN, M.D.

## MISCELLANEOUS

**Borghetti, U., and Dominis, P.: Associated Neoplasms of the Genitomammary Spheres** (Neoplasie associate della sfera genito-mammaria). *Tumori*, Milano, 1941, 27: 171.

Twenty-one instances of coincidental development in the same individual of malignant neoplastic changes in the breast and sexual organs are subjected to clinical and statistical study. They include the coincidental development of cancer of the breast and uterus in 17 cases, of cancer of the breast and vagina in 3 cases, and of cancer of the breast and ovary in 1 case.

The first question in the investigation, of course, is whether this number of associated tumors is greater with reference to single tumors than could be expected as a mere matter of chance. The authors do not attempt to prove this statistically, but their impression from their own experience and from their study of the literature seems to be that the number of associated tumors is greater. In 3 of the cases in this material the 2 tumors developed simultaneously in the two locations; in the remainder the neoplasms developed in succession, several years elapsing between the appearance of the first neoplasm and the second one or more than one. Whether this odd association of developments in the functionally interrelated genitomammary group of organs is due to a simultaneously acting carcinogenic factor or an intermittently acting factor in tumors developing in succession, or whether it is due to a simultaneous or transient receptivity in the organs affected, the authors do not attempt to solve, and they do not accept the "hazardous and problematic" theories suggested by others in this connection.

Nevertheless, they concede that the reason for the development of these multiple tumors will perhaps be found in the close endocrine connection between the mammary glands and the genital organs. The most striking example in the authors' material tending to support the theory of a causal interrelationship was that of a patient who, 7 years after the removal of a mammary neoplasm, had the other breast excised for the same reason, and 4 years after the second operation she underwent a Wertheim operation for carcinoma of the uterus.

However, this patient is still alive and well 2 years after the last operation. This fact and some of the authors' other cases bring up the assertion of other authors that the multiplicity in cancers mitigates the prognosis—that the development of one neoplasm has a sort of "vaccinating effect" toward the development and course of a subsequent malignancy or malignancies. The authors reject this theory.

JOHN W. BRENNAN, M.D.

**Barrett, C. W.: The Important Dividing Wall between Caudal Herniation and Prolapse of the Abdominal or Pelvic Viscera.** *West. J. Surg.*, 1946, 54: 279.

The great body cavity enclosed by the walls known as the cephalad, ventral, lateral, dorsal, and caudal walls furnishes housing for sensitive structures important to the body economy. While these enclosed structures make connections with functioning structures and terminal openings in other parts of the body, the walls are so woven around these terminals and connections that in most instances the walls remain intact and impervious to escape efforts of the enclosed viscera and structures. However, there are many exceptions to this, because of structural imperfections and weaknesses, and traumas and forces which produce pressure on the walls and contents which lead to the escape of the enclosed structures through the walls. These escapes are already known as hernias except in the caudal region.

Due to much erroneous thinking and misjudging of the structures of the caudal wall (the perineal body, the perineal outlet, the vaginal outlet, and the pelvic diaphragm), we have come to understand that the caudal wall is possessed of a musculofascial structure, composed of 5 layers of fascia and 3 layers of musculature. Its integrity depends upon its complete circumference, origin, and median insertion. Thus, like the ventral wall it is subject to injury and hernial dilatation, but unlike the ventral wall it is handicapped by openings or "faults" for the passage

of tract terminals, which are responsible for the fact that hernias are much more common after the injuries of childbirth.

The change of the long axis of the body from the horizontal to the vertical position required an extensive evolutionary engineering feat to provide for the extra weight thrown upon the caudal wall and to fit the tract terminals into the newly formed wall so that the integrity of the wall tract support would not suffer.

There is no difference of opinion about protrusions of the viscera into or through the abdominal wall constituting hernias in the cephalad, ventral, lateral, or dorsal walls, and there should be no further difference of opinion in regard to protrusions through the caudal wall.

The dividing line between prolapse, an intra-abdominal faulty position, and herniation—a visceral protusion, is clear. Prolapse is a downward wandering of structures in the abdomen, which may eventually reach the pelvis, or pelvic floor. Herniation is a wandering of viscera or intra-abdominal structures into, through, or outside of the abdominal wall, and in the caudal region they may dangle between the thighs.

The vagina, bladder, rectum, and uterus, which lie in the pelvis, are not hernial sacs, canals, tubes, or repositories; when they have passed below the pelvic floor, they themselves become herniated structures.

It is quite improper to speak of a cystocele or rectocele. The usual conditions are urethrocolpocele, urethrocystocolpocele, cystocolpocele, rectocolpocele, uterocolpocele, metrocolpocele, and different combinations. The bladder, the rectum, and the uterus find no hernial ring until the pelvic floor ring is reached, and can, therefore, constitute no herniation. It would be an unwarrantable error to interpret any hernial terms as applying alone to the visceral structure. Any one of these terms with the suffix "cele" or a combination of them under the suggested group name of "herniosis" has its primary pathology and etiology in the impairment of the musculofascial caudal wall. The bulging of a visceral structure through this weakened wall is a secondary impairment, and is included with the wall damage in the single or multiple herniations. Herniations of the uterus and bladder mentioned in earlier medical literature refer mostly to inguinal, ventral or crural protrusions.

The break through of the urethra, bladder, rectum, uterus, anterior and posterior cul-de-sacs, with perhaps other important structures, may justly be termed pelvic floor herniosis. HARRY W. FINK, M.D.

**Ingiulla, V.: Bone Metastases in Genital Carcinoma** (Di alcune metastasi ossee in carcinomi genitali). *Riv. ital. gin.*, 1944, 27: 67.

Four cases of bone metastasis in cancer of the uterus are described and illustrated with roentgenograms. In 3 of the cases the metastasis was in the bones of the pelvis or in the lumbar vertebræ, adjacent to the primary tumor. In the other case the metastasis was in the lower end of the femur, the internal condyle being entirely separated from the rest of the bone. The patella and tibia also showed rarefaction.

Thus, in 3 of the cases the metastasis was adjacent to the primary tumor, while in the fourth it was at a distance. This is about the proportion of near and distant metastases reported in larger collections of statistics. In the former group the metastasis is by contiguity through the lymph glands lying near the bone, while in the latter it is carried by the circulation. Sketches are given showing the localization of the lymph glands in front of the lumbar spinal column and the distribution of the pain radiating from them.

In case of unexplained pain with this distribution following an operation for genital carcinoma—for these metastases have been reported following carcinoma of the ovary as well as of the uterus—careful roentgen examination should be made for bone metastases. It may not always be possible to demonstrate them even with roentgen examination but if they are advanced, typical roentgen pictures will result, which may be of osteolytic, osteoplastic, or mixed forms. These pictures are described in detail.

It is true that the demonstration of such metastases is not of great clinical importance for they inevitably cause death. The most that can be expected is to control pain by irradiation. However, it does afford a means of studying the clinical course and pathological anatomy of genital carcinoma and the metastases explain some postoperative symptoms of which the nature has heretofore not been understood. AUDREY G. MORGAN, M.D.

# OBSTETRICS

## PREGNANCY AND ITS COMPLICATIONS

**Parviainen, A.: On the Possibility of Nephelometric Examination of Proteinuria in the Prophylaxis of Nephrogestosis** (Sur la possibilité de l'examen néphélométrique de proteinurie dans la prophylaxie de la néphrogestose). *Acta obst. gyn. scand.*, 1946, 26: 161.

The appearance of nephrogestosis is the most disturbing complication of pregnancy and delivery.

The subjective symptoms of this condition are often mild and do not disturb the patient. During the usual prenatal examination the ordinary signs of nephrogestosis—swelling, elevated blood pressure, and impaired urinary function—are found late. Albuminuria occurs before these signs. The author considers all cases of albuminuria during pregnancy as pathological and has employed the so-called nephelometric test as the most delicate test to prove the presence of this condition.

The purpose of his work, the author states, is first of all to ascertain, with the aid of the nephelometric test, whether a determination of a minute amount of albumin in the urine made once in the course of pregnancy has any significance in nephrogestosis as to the prognosis during delivery; and then to determine in the same individual the variations in the amount of albumin in the urine during pregnancy and labor and try, if possible, by these tests to determine the influence of excitement and eventual fatigue on the amount of albumin and the prognosis.

The nephelometric method which the author has employed is one modified and tried by Brun..ner. It is to be published at a later date. It has, among other things, proved that small amounts of protein, up to 1 mgm. per cent, can be derived from many substances, but those larger than 1 mgm. per cent come manifestly from albumin. The metho.. is very simple.

A total of 310 specimens of sterile urine were examined by the author. All the specimens were taken from women from 3 to 10 months pr ant, the majority of the specimens being taken d.. ing the last part of pregnancy.

All the women tested had frequented the prenatal clinic from March to May, 1945. Simultaneously with the nephelometric tests of the urine specimen, the sulfasalicylic acid test and the test of Heller were done. The sulfasalicylic acid test was positive in only 5 cases (1.6%) and opalescent in only 3 of the cases. Heller's test was positive i . only 2 cases (0.6%).

Following the nephelometric metho.., the presence of albumin ($\leq$ 1 mgm.%) was proved in 103 (33.2%) of the total of 310 cases. The amounts of albumin were for the most part relatively small (from 1.0 to 2.0 mgm.%). By this method smaller quantities of albumin in the urine can be detected than by either the sulfasalicylic acid test (in which opalescence begins only at 22.7 mgm.%) or Heller's test.

In 230 of the 310 cases examined, the results were checked at the time of delivery.

In only 2.9 per cent of the cases which showed less than 2.0 mgm. per cent of albumin by the nephelometric test the patients showed signs of nephrogestosis and these revealed a mild form of this condition.

Of the patients who showed more than 2.0 mgm. per cent of albumin by the nephelometric test, 23.2 per cent developed a severer grade of nephrogestosis.

Thus, with a single nephelometric albumin determination made relatively early in pregnancy, the danger of impending nephrogestosis can be ascertained with great exactitude. By observing these cases more closely, prophylactic measures can be employed to prevent the development of severe nephrogestosis. BLACKWELL MARKHAM, M.D.

**Harjola, O.: Studies on the Peripheral Blood Picture during Pregnancy and the So-Called Anemias of Pregnancy** (Beitraege zur Kenntnis des peripheren Blutbildes waehrend der Schwangerschaft und der sogenannten Graviditaets-Anaemien). *Acta obst. gyn. scand.*, 1946, 26: 7.

The object of this study has been to clarify the nature of the blood picture in pregnancy and in anemia of pregnancy. An attempt was made to determine whether or not the anemia of pregnancy is associated with certain changes in the blood picture and whether the anemia of pregnancy is a true anemia or a manifestation of a hydremic state. Investigations were made with respect to the following factors:

1. Hemoglobin content of the blood,
2. Erythrocyte count,
3. Color index,
4. Reticulocyte count,
5. Leucocyte and differential count,
6. Erythrocyte diameter and its range,
7. Total and average volume of erythrocyte per cubic millimeter,
8. Volume index and saturation index of erythrocytes,
9. Serum iron,
10. Examinations of the urine for albumin and sugar,
11. Stool examinations for parasites,
12. Test meals for free and total hydrochloric acid.

As a control group, 16 healthy, nonpregnant women were chosen for study. A second group consisted of 82 healthy, pregnant women. The patients exhibiting anemia during pregnancy were divided into two groups: (1) those with mild anemia (hemoglobin from 60 to 69 per cent, Sahli), 71 patients; and (2) those with severe anemia (hemoglobin less than

60 per cent, Sahli), 51 patients. Some of these patients were studied during several months of their pregnancies.

A review of the literature on hemoglobin values and erythrocyte counts during pregnancy reveals marked differences of opinion among various authors, most of whom conclude that these values are lowered. Some maintain that they are increased, while others report that they are unchanged or variable. Studies on 82 healthy pregnant women indicate that hemoglobin levels and erythrocyte values are approximately the same for all months of pregnancy and correspond with the values found in the normal control group. In normal gravidas, compared with nonpregnant women, the color index shows a slight rise, especially in the later months of pregnancy. The number of cases is too small and the range too great, however, to draw any definite conclusions from the increase of the average color index value. Reticulocyte values are fairly constant and show an increase from the fourth month on, up to 35 per cent. It can be concluded that pregnancy gives rise to a brisk regeneration of red cells.

These studies show that there is a leucocytosis from the beginning of pregnancy, the increase being more marked toward term but remaining within physiological limits. From the second month on, and becoming pronounced at the fourth month, there is a shift to the left of the neutrophilic leucocytes. No consistent decrease of eosinophils was observed, although in a few cases they disappeared and in others they decreased. The basophilic leucocyte, lymphocyte, and monocyte counts correspond to normal values. The mean diameter of the erythrocytes and the range of variation in individual cases showed no alteration when compared to the values obtained in healthy, nonpregnant women. Pregnancy did not cause anisocytosis, nor did it influence significantly the cell volume or saturation index. The values of serum iron appear to be increased during the entire period of pregnancy and especially toward term.

It was found almost without exception that in the group of pregnant women with mild anemia, having hemoglobin values between 60 and 69 per cent, the erythrocytes had decreased in proportion to the hemoglobin, while the color index maintained a ratio comparable to that found in healthy gravidas. The average value for reticulocytes in all cases was increased about 13 per cent compared to values for healthy gravidas, which indicated more active erythropoiesis. As in the group of healthy gravidas there was a leucocytosis, more marked in the last months of pregnancy. The neutrophilic leucocytes were increased from one month of pregnancy to the next, and the same shift to the left was observed as that in healthy gravidas. The range of the erythrocyte diameter was greater than in normal pregnancy, and anisocytosis, though slight, was observed, but the reduction in the amount of hemoglobin did not influence the mean value of the diameter of the red blood cells. The reduction in hemoglobin in this group did not affect the cell volume nor saturation of the erythrocytes. From the sixth month on the serum iron showed a distinct decrease, averaging 36 per cent compared with that of healthy gravidas, who showed an increase in serum iron. This fall was not in direct proportion to the reduction in erythrocytes. A hyposideremia was noted as a result of the decreased hemoglobin. The secretion of gastric hydrochloric acid did not appear to be related to the serum iron level. It is concluded that the blood changes noted in the group of mild anemias of pregnancy represent a true anemic state, which cannot be explained simply on a basis of hydremia or thinning of the blood.

In the group of severe anemias, with hemoglobin values below 60 per cent (Sahli), it was found that the fall in hemoglobin was greater than that of the erythrocytes when comparison of mean values was made with respect to the healthy group of gravidas. The color index was decreased 20.8 per cent. A 50 per cent increase in reticulocytes on comparison with the nonpregnant group, and an 11 per cent increase on comparison with the group having mild anemia was noted. The average values for leucocytes were increased over those obtained in healthy gravidas, and were found to increase from month to month. There was no correlation between the decrease of hemoglobin and the increase in leucocytes. A shift to the left and an increase in neutrophile leucocytes from month to month was found. The remaining white blood picture showed no departure from normal. The mean diameter of the erythrocytes was not affected by the diminished hemoglobin, but anisocytosis was increased 18 per cent over that observed in healthy gravidas. Studies on the erythrocyte volume revealed cases in which the volume was normal and others in which it was decreased. Thus, both normocytic and microcytic types of anemia were encountered. The diminished hemoglobin was associated with no significant change in saturation. The mean serum iron value was found to be decreased 61 per cent compared with the same value for healthy gravidas. The secretion of gastric hydrochloric acid did not appear to be a causative factor even in the most severe cases of anemia of pregnancy.

The author did not encounter malignant anemias of the pernicious or aplastic type in this series of cases. JOHN L. LINDQUIST, M.D.

## LABOR AND ITS COMPLICATIONS

**Johnson, H. W.: The Clinical Diagnosis of Varying Degrees of Uterine Contraction Rings.** *Am. J. Obst.*, 1946, 52: 74.

It is assumed that the contraction rings generally reported are of the severe variety and occur with obstructed labors. Reasons are given for the firm conviction that a milder variety or subclinical and larger group occurs with otherwise unobstructed labors.

The maternal mortality, operative incidence, and fetal mortality, as reported in a collective review of

the literature, are compared with similar figures obtained from treatment of a large series of subclinical or early contraction rings. The incidences of contraction rings in several institutions in Houston, Texas, are given to show the variance due to this complication of labor.

Early rupture of the membranes is believed to be a predisposing factor in the development of uterine rings. Temporary or functional rings are recognized. Cardinal signs and symptoms of ring dystocia are given, and the development and diagnosis of these rings are depicted in diagrams. The usual methods of delivery in association with ring dystocia are described. EDWARD L. CORNELL, M.D.

**Moracci, E.: Study of the Mechanism of Delivery in Brow Presentation** (Contributo allo studia del meccanismo del parto per la fronte). *Arch. ostet. gin.*, 1946, 51: 17.

The material for this study comprises 14 cases of frontal or brow presentation which were observed in the period between November 1, 1936 and October 31, 1943. Five of these terminated spontaneously and the author observed these personally. Five of the 14 patients were primiparas. The position of the fetal head during engagement in 5 instances was occiput left anterior, and in 5 it was occiput right posterior; in 3 it was occiput right anterior, and in the remaining case it was occiput left posterior. All deliveries except 1 were at term. The fetal weights, exclusive of the premature infant, were less than 3,000 gm. in 4 instances, between 3,000 and 3,500 gm. in 6, and between 3,500 and 3,750 gm. in 3. Thus, in 9 cases the weight was above 3,000 gm., which refutes the claims of some writers that the fetus in brow presentation is always premature.

In the 5 cases of spontaneous birth there were 3 fetal deaths; in the 9 of artificial delivery there were 6. The methods used consisted of a Thorn maneuver, a vertex presentation being substituted for the brow presentation; this resulted in a normal delivery with a live child. Version resulted in a dead fetus; forceps delivery in 2 cases resulted in a dead fetus in each case; the 2 cesarean resections resulted in the delivery of 2 living children; and, finally, 3 craniotomies were done on fetuses which were already dead. The author thinks that these results should cause the profession to think seriously of extending the indications for cesarean operation.

In all 5 of the spontaneous deliveries the pelvis of the mother was normal, and in all 5 the presentation never changed—the frontal bosses retained their relationship to the pelvic axis throughout the entire period of labor. In 2 cases the position was occiput left anterior: in the others it was occiput right posterior. In the latter 3 fetuses and in the 1 immature infant the face rotated anteriorly with the root of the nose under the pubic arch.

In the 3 normally developed infants the mouth could be felt to be widely opened during this process, becoming fixed under the pubic arch; in the other, rotation was not complete, the nose and superior maxilla coming to rest under the ischiopubic ramus in the vicinity of the subpubic angle, and the disengagement was effectuated in a diameter intermediate between the right oblique and the anteroposterior (the paraoblique diameter of Motta). Even in this case the wide opening of the fetal mouth with the stemming of the border of the superior maxilla (hypomochlion of rotation) against the right ischiopubic ramus could be demonstrated.

The author admits that delivery may occur in brow presentations by other mechanisms and from other positions, for instance when the head persists in a transverse position or the face turns backward into the hollow of the sacrum and persists in this position; however, he thinks that such mechanisms are the exception and not characteristic of the typical brow presentation. Madame La Chapelle thought that the greatest diameter of the fetal head (13.5 cm.) in the typical brow presentation passed down on an even keel, parallel to the plane of the superior strait (of which the greatest diameter is 13 cm), by a marked process of molding of the head. Mangiagelli thought that this diameter passed through the smaller diameter of the strait on a slant with the chin end lower than the back of the head. Pollosson thought exactly the opposite, viz., that the occiput passed through the superior strait in a lower position than the chin. However, Alfieri concluded, on the basis of experiments, in which he pushed the head of fetuses mounted on a universal joint at the end of a wooden stake down through the skeleton of pelves, that in the typical brow presentation the fetal chin stems against the superior ramus of the os pubis and gives back as the mouth of the fetus opens widely. Thus, the maxillosagittal diameter is substituted for the greatest, or mentosincipital, diameter, and it is around this diameter (which is about 5 mm. shorter than the greatest diameter) that the fetal head rotates as a bascule to keep the frontal bosses always in the center of the pelvic axis.

It is this explanation of Alfieri that the author accepts, and in testing its validity he came upon his clinical findings of the open mouth of the fetus, and conducted his cephalometric studies. In these studies the heads of 10 fetuses which had been born dead in the clinic were subjected to cephalometric measurements in a species of Broca cephalometer. The head was suspended in a position characteristic of the brow presentation, with the frontal bosses just touching the bottom of the box (which he designates as the plane of the frontal bosses). The other diameters were measured by means of moveable points attached to the side pieces which were graduated in millimeters. By this means it was found that with the mouth closed the average length of the mentosincipital, or greatest cephalic, diameter was 137.6 mm., and with the mouth opened it was 129.6 mm.

Also, it was found that the new direction of the mentosincipital plane had changed from one practically parallel with that of the superior plane of the pelvis (plane of the frontal bosses) to one at an angle

of 10 degrees with the sincipital end entering the superior strait and passing down to leave the inferior strait before the chin entered the cavity of the small pelvis. Thus, no flexion of the head (bascule motion) appeared to be necessary until the sincipital end of the mentosincipital diameter had passed through the inferior strait and was resting on the perineum.

The author thinks that in this manner he has demonstrated the possibility of explaining the movement of the fetal head in brow presentation without the difficulties which have previously been considered insurmountable. JOHN W. BRENNAN, M.D.

## MISCELLANEOUS

**Laffont, A., and Curtillet, A.: Anatomoclinical Study of the Osteomalacic Pelvis** (Étude anatomo-clinique du bassin ostéomalacique). *Gyn. obst.*, Par., 1946, 45: 28.

This report has been prepared by Laffont and refers to material accumulated during the period while he was working in collaboration with Curtillet in Algiers. The observations were conducted on the material in the museum of the University of Algiers and include clinical and roentgenological studies of several of the authors' own patients.

The stress of muscular pull is accorded only secondary importance in the development of the deformities characteristic of osteomalacic pelvis and the muscular factor is given but scant attention. The authors believe that the entire pathological picture can be explained on the basis of the interplay of forces when the weight of the upper part of the body passes downward through the spinal column to the sacrum and the "ground thrust" upward passes through the femur and hip joint. However, these forces produce different effects consonant with the different body postures, that is, on standing, sitting, or lying, and this leads naturally to a 3 way division of the theme. However, it is not to be understood that osteomalacic deformity seen in practice is a pure deformity, that is, that it is always the result of the forces in action only in the standing, sitting, or lying postures. In the fully developed deformity an attentive study will enable the observer to distinguish the factors in the final result which originated while the patient was still able to walk about, from those which developed when the sufferer was compelled to abandon walking and sit, or lie on his back or side.

While the patient is still ambulant the deformities which develop involve the superior and inferior rami of the pubis, the region of election of pelvic fractures, and the sacrum, lumbar vertebræ, sacroiliac joint, and posterior region of the iliac alæ. The heavy, bony mass of the ilium lying back of, and upward from, the glenoid cavity (the so-called sciatic spur of Latarjet and Gallois) encompasses the region of the incisura ischiadica major and resists deformity.

Anteriorly, the pubic rami are crumpled inward and take with them the glenoid structures, so that the socket of the hip joint comes to face anteriorly,

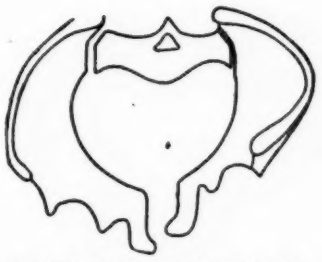


Fig. 1. (Laffont and Curtillet.) Deformity of the left side on lateral decubitus.

which diminishes the amount of abduction and exterior rotation of the femur. Of course, in the last stages of the condition there are changes in the hip joint itself, such as calcification of the labrum glenoidale and shrinking of the ligaments about the capsule which not only intensify the limitations of motion described but finally eventuate in inability to extend the hip joint itself. Posteriorly, an exaggerated lordosis develops, the sacrum is pushed downward, tipped anteriorly, and bent into a sharp hooklike deformity by the pull on its lower end by the powerful sacrotuberous ligament.

In the sitting posture the forces acting about the sacrum and adjoining structures continue, and in extreme cases even succeed in opening further the angle, or dome, formed by the massive resistant bony framework about the greater sciatic notch (spur of Latarjet and Gallois).

In the dorsal decubitus there are no important changes; however, if the patient lies upon her side the pressure of the body acts on the greater trochanter and region of the anterior, superior spine of the ilium, exaggerating further the curve of the iliac crest and the inward deformity of the pubic rami on that side, so that the end result will be that depicted in Figure 1. Such extreme deformities are probably more common in Algerian women because of their oriental habit of sitting cross-legged on the floor.

Medical treatment, such as endocrine therapy is not considered, the discussion being confined to the prevention or amelioration of the deformities consequent to osteomalacia of the pelvis in the female. Since the sacrum tends to lose its structural peculiarity of wedgelike or keystonelike integration into the sacroiliac joint and to hang loosely by the sacroiliac ligaments, the author suggests doing an early sacroiliac arthrodesis by osseous implantation into the space between the angle formed by the posterior end of the iliac alæ and the posterior aspect of the sacrum. This will perhaps, prevent the development or accentuation of the downward and forward sinking of the sacral mass, and the effect of the added calcium in the implant on the general calcium metabolism can be observed. The retraction at the hip joint might be relieved by sectioning of the ligament of Bertin. The author on 2 occasions has sectioned the pubic rami, once from above downward in one

patient, and from behind forward in the other, in order to increase the space between the pubic bones and to make the vagina more permeable; in this way an appreciable correction of from 15 to 20 mm. was obtained. JOHN W. BRENNAN, M.D.

**Vara, P.: Studies on Elderly Primiparas** (Studien ueber alte Erstgebaerende). *Acta obst. gyn. scand.*, 1946, 26: Supp. 2.

Of 19,216 primiparas delivered at the Women's Clinic of the Helsinki University from 1927 to 1941, 3,557 were 30 years of age or more. Of the latter, 2,592 were from 30 to 34 years of age, 778 from 35 to 39 years, and 197 were 40 years or more. A comparison was made between full term deliveries in these patients and those in young primiparas under 30 years. A considerable increase in the number of older primiparas began in 1935 and has persisted. Breech position occurred in 3.38 per cent of the older primiparas, a slightly higher incidence than that observed in the younger group. Contracted pelvis and deflexion conditions showed no increase. Premature rupture was much more frequent in the older group, occurring in 28.16 per cent as compared with 0.86 per cent in the younger women. Early and late ruptures were less frequent in the older primiparas. The incidence of premature rupture was the same in cases with contracted and with normal pelves, which indicated that contracted pelvis plays no part in the etiology of premature rupture. Of the various stages of labor, the third was that showing the greatest difference in the older primiparas from that in young primiparas, although this too was only "apparent." Previous abortion definitely shortened the course of labor. The duration of labor in premature rupture was 6 hours less than in early rupture and 3 hours less than in late ruptures. Surgical delivery in full term pregnancies with normal pelves was required in 22.43 per cent and was distributed as follows: forceps, 12.51 per cent, cesarean section 4.26 per cent, dilatation or uterine forceps 2.29 per cent, amotio placentae manualis 0.95 per cent, craniotomy 0.26 per cent, internal version plus extraction 0.10 per cent. The incidence of surgical delivery increased with age, being 18.67 per cent in the age group from 30 to 34 years, 26.1 per cent in that from 35 to 39 years, and 42.6 per cent in that from 40 years and up. The incidence of surgical intervention for contracted pelvis was 42.9 per cent. The total incidence of surgical intervention in full term deliveries in elderly primiparas was 23.94 per cent, almost 50 per cent higher than that in young primiparas. Previous abortion seems to diminish the need for surgical intervention.

The incidence of nephrogestosis was no higher in the elderly than in the young primiparas, but cases of severe nephrogestosis, eclampsism, and eclampsia were more frequent in the older group. The total incidence of infection showed no increase in the older as compared to the younger patients.

As age advances the incidence of uterine myoma and extragenital disease is higher, including organic cardiac disease. Primary weakness of labor pains was noted in 6.8 per cent of the elderly primiparas and secondary weakness in 18.21 per cent—over 50 per cent more than in young primiparas. Rupture of the soft parts occurred more frequently in the older group, but only ruptures of the first degree.

The bleeding tendency in the third stage of labor does not seem greater in elderly than in young primiparas but atonic hemorrhages of less than 500 gm. occurred much more frequently in the older group, particularly in patients of 40 years or more. The incidence of placenta previa (0.28 per cent) was somewhat higher than in younger patients (0.09 per cent), but ablatio placentae ante tempus showed no significant increase as compared with that in the younger group.

Weak labor pains occurred considerably more frequently in the older patients. From the indications for forceps delivery it was evident that inertia, exhaustion, or both constituted about 40 per cent of the indications. Inertia and exhaustion constituted indications for cesarean section in 29.9 per cent, and in completed deliveries inertia occurred in 6.80 per cent and exhaustion in 18.21 per cent of cases, thus in twice as many of the older patients as in the younger group.

The maternal mortality in full term deliveries was 0.55 per cent (in spontaneous deliveries 0.12, and in surgical deliveries 4.1 per cent). In cesarean sections the maternal mortality was 4.9 per cent and in forceps deliveries, 0.7 per cent. This mortality rate was considered as being "probably" greater than in younger primiparas. The average weight of the infant, 3,535.1 gm., was definitely greater than that in the younger group. The general ratio of male to female infants in the entire material was 107.05 to 100.0, but in patients of 40 years or more the ratio was 136.6 to 100.

Asphyxia occurred in 7.36 per cent of the infants, being an indication for forceps delivery in 17.9 per cent and for cesarean section in 14.2 per cent of the cases. The infant mortality rate for full term deliveries was 3.07 per cent (corrected figures 2.70 per cent), and was definitely greater than that in young primiparas. In spontaneous deliveries the infant mortality rate was 2.23 per cent and in surgical deliveries, 5.6 per cent; in breech deliveries it was 8.1 per cent. In extraction cases, the infant mortality rate was 33.3 per cent; in dilatation or uterine forceps cases, 18.5 per cent; in forceps deliveries 3.1 per cent; and in cesarean sections, 2.2 per cent. Premature rupture did not influence the infant mortality.

Premature deliveries occurred in 8.52 per cent of the older women, thus statistically they were only "probably" higher than in young primiparas. In premature rupture nephrogestation occurred in 36.0 per cent (with eclampsism in 13.9 per cent, and eclampsia in 5.9 per cent). Ablatio placentae ante tempus occurred in 5.3 per cent of the premature deliveries; the incidence of surgical intervention was the same as in full-term deliveries (23.1 per cent),

and the incidence of cesarean section was 6.9 per cent. The maternal mortality in premature deliveries was 2.3 per cent, and the infant mortality in the different weight groups was as follows: for infants weighing from 600 to 995 gm., 100 per cent; for those weighing from 1,000 to 1,495 gm., 67 per cent; for those weighing from 1,500 to 1,995 gm., 37 per cent; and for those weighing from 2,000 to 2,495 gm., 16 per cent.

Elderly primiparas may be classified into two groups, one group of constitutionally completely normal subjects, and the other of infantile-hypoplasic and presenile parturients. The latter suffer more complications in delivery than the former. In infantile-hypoplasic women conception is retarded. If conception was retarded more than 2 years the incidence of surgical intervention was higher (28.2 per cent) and the duration of labor longer (27 hrs., 55 min.) than in subjects in which conception took place before the 2 year period (24 per cent and 25 hrs. 54 min., respectively).

The women requiring surgical intervention were shorter and stouter than those in whom spontaneous delivery was possible. The age of onset of the menses, which was definitely retarded as compared with the younger group, had no effect on the frequency of surgical intervention.

Since 1935, puncture of the membranes has been employed routinely to hasten delivery when the os uteri has opened to 4 cm. and the conditions are otherwise normal. Also, cesarean section has been done promptly rather than expose the infant to the difficult forceps delivery. In the period from 1935 to 1941, rupture of the membranes was instituted twice as often as in the period from 1927 to 1934. The use of forceps delivery diminished from 19.16 per cent to 9.02 per cent, while cesarean section, on the other hand, increased from 2.19 per cent to 5.56 per cent. The maternal mortality rate fell from 0.88 per cent to 0.28 per cent, and the infant mortality rate increased from 1.72 per cent to 3.39 per cent. However, this last increase was noted only in spontaneous and breech deliveries, and was attributable to employment of the majority of the regular nursing staff in Army work during the years from 1939 to 1941, which left the problem of deliveries in the hands of temporary workers.

Since the prognosis of both mother and child is less favorable in elderly primiparas, these patients should receive most careful attention. A careful anamnesis and physical examination will reveal changes due to age as well as delayed conception. Elderly primiparas should always be hospitalized for delivery.

EDITH SCHANCHE MOORE

# GENITOURINARY SURGERY

## ADRENAL, KIDNEY, AND URETER

**Forni, P.: Paroxysmal Hypertension Caused by Tumor of the Suprarenal Medulla** (L'ipertensione parossistica da tumore medullo-surrenalico. *Arch. ital. chir.*, 1945, 67: 223.

The symptomatology of a suprarenal medullary tumor in a 32 year old man was complicated by tuberculosis of the kidney.

The author points out that a tumor with functioning chromaffine cells in the medullary zone of the suprarenal glands may be responsible for hyperadrenalinemia, which in turn may cause paroxysmal attacks of hypertension.

Removal of the tumor resulted in a complete cure.

JOSEPH K. NARAT, M.D.

**San Martino, N.: Statistical Report on 73 Patients with Unilateral Renal Tuberculosis Treated by Nephrectomy** (Relazione clinico-statistica su 73 pazienti affetti da tubercolosi renale unilaterale nefrectomizzati). *Arch. ital. urol.*, 19. 3, 20: 209.

From a discussion of an extensive material the author hopes to be able to clarify the various guises under which unilateral renal tuberculosis may be found, and thus lead to a better understanding of the early diagnosis of this condition in order that surgical treatment may be given promptly.

Men were affected with kidney tuberculosis somewhat more frequently than women, perhaps because of their more frequent exposure to physical exhaustion and trauma. Those most frequently affected were in the fourth and fifth decades of life. There was a personal history of complicating tuberculous involvement of other organs in 44.1 per cent of the cases. These were subdivided as follows: tuberculosis of the lungs, 2.06 per cent; of the bones, 5.4 per cent, of the genitalia, 9.5 per cent, and of the pleura, 23.2 per cent. (Among his own cases the author found concomitant tuberculous involvement of the lungs in 1.03 per cent. of the osseous system in 2.06 per cent, and of the genitalia in 12.3 per cent.) The symptomatology was predominately renal in only 13.6 per cent of the cases and predominately cystic in 67.1 per cent.

The author anticipates the most troublesome delays in diagnosis in the patients with symptoms of urinary colic suggesting calculus and those with hematuria suggesting tumor. The urine was clear and free of pathological elements in only 1.03 per cent of these patients. The tubercle bacillus was demonstrated in the urine in 53.4 per cent of the cases.

The author believes the most satisfactory method of demonstrating the bacillus of Koch to be centrifugalization of a large amount of urine (1 liter) in the apparatus of Forsell and seeding of the sediment on Petragnani's medium with asparagine. The surface of the plate is scraped after 7 or 8 days with a platinum loop and the material thus procured is transferred to a microscopic slide and stained by the method of Ziehl.

The affected kidney was removed under spinal anesthesia (2.5 c.c. of procaine hydrochloric acid in 4 per cent solution). The total mortality was 6.8 per cent: 3 patients (4.1 per cent) died on the day of operation, and 2 died some months afterward. All the others were cured of their symptoms; however, in 2 the symptoms reappeared some years later and tubercular involvement of the remaining kidney was found.

One instance of horseshoe kidney was encountered and in this the kidney was divided at the isthmus and the affected part was successfully removed.

JOHN W. BRENNAN, M.D.

**Bouchard, R.: The Effect of Renoureteral Lithiasis on the Upper Urinary Tract** (Le retentissement de la lithiase renourétérale sur les voies urinaires supérieures). *J. urol. med.*, Par., 1944–45, 52: 253.

The routine use of urography in the study of the morphological changes produced by calculi has yielded interesting results. Pyelography reveals only the excretory passages, such as the ureter, renal pelves, and calices, but urography reveals more. In some urograms an opacity of the entire parenchyma may be demonstrated, showing the effect of the calculus on the intraparenchymatous excretory passages and on the uriniferous tubule itself. In a urographic study of 38 cases of lithiasis, including 22 cases of calculus in the renal pelvis, 5 in the calices and 11 in the ureter, the author observed an image which he believes to be of diagnostic significance. He feels, therefore, that urography should be the method of choice, especially since the dangers of introducing a probe into the ureter in cases of aseptic lithiasis may thus be avoided. This danger of infection has led to a more routine use of urography. With the aid of intravenous urography, it is possible in a case of renal colic to demonstrate the cause as a calculus from the presence of dilated calices, even if the calculus has been expelled or is invisible in the roentgenogram. By this means a more favorable prognosis can be established in cases showing a marked dilatation above the calculus, a finding hitherto only too frequently taken as an indication for nephrectomy.

The significance of retrograde dilatation is wholly different from that of dilatation due to inhibition of the innervation. The former is a result of increased urinary pressure with resulting strain and eventual exhaustion of the muscle fibers. In the presence of irreversible lesions of this type, nephrectomy would be imperative. On the other hand, when it can be demonstrated that the dilatation is due merely to a hypotonia of the muscle fibers, the power of con-

traction may still be retained. Such a process permits of greater optimism. In spite of the recommendations for conservative treatment in urinary lithiasis, nephrectomies are still done for dilatations considered irreversible according to classic interpretations.

The author believes that the theory of pathogenesis presented will permit extension of the indications for conservative operations. He emphasizes the futility of laying down any rigid rules in the presence of a physiology as complex as that of the urinary apparatus, but hopes that his theory will help to limit the indications for nephrectomy in lithiasis.

The renal pelves do not show any changes roentgenographically in the presence of a calculus, except for the distention due to the stone itself. In the calices, however, the calculus will produce either a multiplication or dilatation of the calices. In the latter instance, the calyx appears as a tube, the papillary end of which terminates in an irregular or convex surface instead of in the ordinary cupule, and there is a rounded dilatation at the origin of the calyx resembling a grape seed. In cases of calculus in the ureter, the urogram shows marked, regular, spherical dilatations at the level of the origin of the calices, but the pelves and ureter appear normal. This is not in harmony with the classical theory of a retrograde dilatation. It seems more likely that a reflex hypotonicity is released by the ureteral segment traumatized by the presence of the calculus.

EDITH SCHANCHE MOORE

**Garvey, F. K., and Gomberg, D.: Vaginal Ureterolithotomy.** *J. Urol.*, Balt., 1946, 56: 49.

The authors present 13 instances of vaginal ureterolithotomy of which only 1 was unsuccessful; this swells the total of such cases recorded in the literature to 127. The single failure reported occurred when the stone slipped to a proximal position and the abdominal approach was necessary to recover the calculus.

To obviate this complication in the future the authors suggest fixing the stone in the ureteral position by wedging it with a ureteral catheter passed alongside of it.

The advantages and disadvantages of the procedure are tabulated. The salient advantages of the vaginal approach are: less shock, rapid convalescence, and ease of operation, while the abdominal approach carries with it definite shock, difficulty of lower ureteral isolation, and postoperative hernia, along with a much more prolonged postoperative course associated with drainage. The abdominal approach, however, permits the exposure of a greater length of the ureter and thus a greater range of calculus excursion and the advantage of increasing the incision for greater ureteral visualization. It is to be noted that these 2 advantages of the abdominal route constitute the only 2 disadvantages of the vaginal approach to a ureteral calculus in the terminal portion of the ureter.

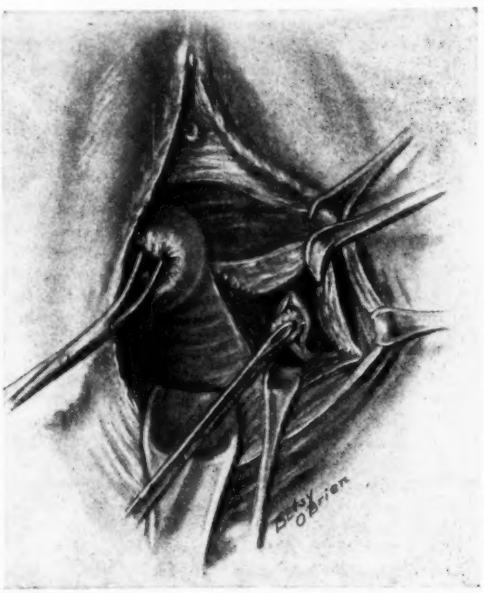



Fig. 1. (Garvey and Gomberg) showing cervix retracted; incision through vaginal wall, exposure of ureter which has been incised, and calculus removed.

The authors report some slight but distinctly advantageous changes in the operative procedure of vaginal ureterolithotomy. A blunt curved hemostat is used to separate the underlying tissue after the lateral wall of the vagina is incised, rather than finger tip dissection.

When the ureter is visualized following blunt instrument dissection an Allis is placed around the ureter above the stone, the ureter forceps is incised longitudinally over the stone, and the latter is removed. The distal and proximal portions of the ureter are then dilated to prevent postoperative ureteral edema with obstruction. The ureter is closed with sutures in the adventitia. A small soft rubber drain is left in the wound, but not against the ureter, and the vaginal wound is closed. The drain is removed in 24 hours and the patient is permitted to be ambulant at this time.

The authors' method affords direct visualization of the ureter, and thus the previous complications of uterine artery trauma with hemorrhage and vesical and peritoneal drainage should be avoided.

ROBERT LICH, JR., M.D.

**Hill, R. M.: Embryoma of the Kidney in the Adult.** *Brit. J. Urol.*, 1946, 18: 53.

The author reports the thirty-sixth case of a Wilms' tumor in the adult. Of the 36 patients, only 4 have survived for an appreciable length of time. The patient whose case is now presented has sur-

vived 5 years. The course of the disease, with a pathological description of the various reported cases, is given. It is noted that seemingly a Wilms' tumor is less malignant in adults than in children.

The treatment of nephrectomy plus irradiation is considered most satisfactory since the survival rate in this group was about twice that of cases in which surgery or irradiation was used independently. There are at least two instances of Wilms' tumor in the adult in which the patients have survived 4 and 10 years.

The case reported is that of a 35-year-old mother who experienced sudden abdominal pain associated with faintness. The patient complained also of some pain in her right side following exertion, and a year previously had had some irritative vesical symptoms for a few days. Examination revealed a large mass in the right renal area which moved with respirations. At operation, using a transperitoneal approach, the right kidney was found to be the site of the tumor and a smooth globular organ with dilated veins over the surface was demonstrated. Following nephrectomy, the patient was given 3,500 roentgen units of deep x-rays and during the past 5 years there has been no evidence of recurrence.

The renal tumor was ovoid in contour and measured 13 by 9 cm., with a lower pole replaced by an encapsulated blood cyst with yellowish bosses. Histologically the tumor revealed three principal cell types: (1) smooth muscles some of which were well differentiated and others of sarcomatous type, (2) lipomatous tissue well differentiated, but some of which was primitive in type, and (3) primitive blood sinuses.

The article is well illustrated and contains a full bibliography. ROBERT LICH, JR., M.D.

**Kahle, P. J., and Schenken, J. R.: Aneurysm of the Renal Artery following Partial Nephrectomy.** *J. Urol.*, Balt., 1946, 56: 1.

Kahle and Schenken report the seventy-ninth case of aneurysm of the renal artery following partial nephrectomy. The patient was a 33 year old white male who entered the hospital because of pain on the left side associated with hematuria. A renal calculus had been removed from the right side 4 months previously. The patient has a mild secondary anemia, a normal phenolsulfonphthalein reaction on each side, and 2 closely approximated circular shadows of calcarious density overlying the inferior pole of the left kidney and identified by pyelography as located within a dilated lower calix. Partial left nephrectomy of the inferior pole was performed.

Because of distention 6 days after operation, an enema was ordered, after which the patient complained of intense pain in the left lower quadrant and passed 600 c.c. of fresh blood and numerous clots. Intravenous infusions were administered, and 48 hours later a second hemorrhage occurred. The pelvis of the left kidney was irrigated with water and adrenalin solution. During the entire postoperative course the urinary output was consistently good.

The patient went to his home by ambulance, 160 miles away, but again began to bleed and was returned to the hospital. In preparation for a left nephrectomy spinal analgesia was given, but the sharp drop in blood pressure contravened the operation. He was transfused several times and later discharged.

Fifty-two days after operation the patient again began to bleed profusely. He was brought back to the hospital by ambulance and died a few minutes after admission to the hospital. At autopsy, a mass, obviously an aneurysm, was found at the lower pole of the left kidney. The clot was composed of the usual laminations of fibrin, islands of agglutinated platelets, and masses of red blood cells and polymorphonuclear leucocytes. A small number of fibroblasts had invaded the clot in some areas. The wall of the aneurysm showed remnants of muscle fibers but for the most part was composed of chronically inflamed connective tissue or granulation tissue. A large number of macrophages filled with hemosiderin pigment were present in some areas around the wall. Immediately adjacent to the wall the renal tissue showed moderate interstitial fibrosis, a heavy infiltration with chronic inflammatory cells, and, in one area, a large mass of chronically inflamed granulation tissue which was continuous with the granulation tissue wall of the sinus tract. A section taken from the rounded protruding areas of cortex showed a diffuse infiltration of polymorphonuclear leucocytes in the interstitial tissues and in the tubules. Stains for elastic tissue showed fragments of elastic fibers in the wall of the aneurysm. Bacterial stains revealed cocci and bacilli within the wall of the aneurysm and in the blood clot. Smears of the exudate in the sinus tract at the lower pole of the kidney showed gram positive cocci and gram negative bacilli. The mucosa of the bladder was intact in the sections examined, but an area just deep to the mucosa showed an infiltration of round cells. The histological diagnosis was mycotic intrarenal aneurysm with rupture into the renal pelvis, and chronic and acute pyelonephritis.

The authors comment that the sex distribution is slightly in favor of males. All the factors operative in aneurysm in other sites seem to be operative in this case, including trauma, infection, syphilis, congenital defects of the arterial wall, and periarteritis nodosa. The presence of a mass is an infrequent sign.

The diagnosis has been made on the basis of a ringlike shadow observed in x-rays of the kidneys, ureters, and bladder, the ring representing calcified deposits in the wall of the sac. Aortic arteriography has been employed for diagnosis. Treatment is prompt surgery, preferably nephrectomy. The surgeon must exercise extreme caution, and the possibility of aneurysm must be suspected in any case in which palpation of the renal fascia reveals pulsation and a bruit. A bluish discoloration of the fascia indicates perirenal hemorrhage.

DAVID ROSENBLOOM, M.D.

**Pfeiffer, G. E., and Gandin, M. M.: Massive Perirenal Lipoma with Report of a Case.** *J. Urol.*, Balt., 1946, 56: 12.

Pfeiffer and Gandin report a case of massive perirenal lipoma. This condition must be considered in the diagnosis of immense abdominal tumors. It is most commonly seen in females, equally often on either side, and usually in patients between 40 and 60 years of age. About 35 per cent of retroperitoneal lipomas are of perirenal origin. There is no definite dividing line between simple hypertrophy of the fatty capsule of the kidney and perirenal lipoma. The tumor may arise from the renal capsule or perirenal tissue, it is retroperitoneal, of considerable volume, may be flabby and pseudofluctuant, hard and fibrous, or of any consistency between these two extremes, multilobular, reddish or yellowish gray, slightly vascular, and surrounded by a capsule which permits easy enucleation. It may contain sarcomatous areas, but unless malignant, the growth is usually slow. It may displace the kidney or envelop it. Associated renal calculi may be present. Symptoms are due to compression and enlargement, such as vague gastrointestinal disturbances, mild backache, or increase in size of the abdomen. The tumor may reach enormous size. There may be weakness, fatigue, nervousness, genital and lower extremity edema, dyspnea, bloating, constipation, vomiting, diarrhea, melena, and eventually cachexia and death. Urinary symptoms are usually absent. Pressure may produce hydronephrosis, pyelitis and oliguria, ascites and dilatation of the superficial abdominal veins, and varicocele. Because of their size, these tumors are frequently confused with large ovarian tumors, inoperable abdominal malignancy, ascites, pancreatic cyst, cirrhosis, and pregnancy.

The diagnosis should be considered in a large abdominal tumor in an adult from 40 to 60 years of age with mild gastrointestinal symptoms and backache, with a history of slow growth, the tumor being relatively smooth, rounded, lobular, and soft. An x-ray film of the chest will show elevation of the diaphragm on the involved or both sides, and there may be upward dislocation of the heart. The gastrointestinal series will reveal dislocation of the intestinal tract. The urine is usually negative but pyelographic studies will demonstrate a distorted ureter and dislocation of the kidney. Transperitoneal nephrectomy is usually indicated. The prognosis is grave and recurrences are frequent.

The authors report the case of a 49 year old white male who was admitted for treatment of an abdominal tumor. He was emaciated above the abdomen and had massive edema of the lower torso and lower extremities, and his abdomen protruded tremendously. The mass filled the entire right flank from the iliac crest to the left costal margin at the anterior axillary line. Retrograde pyelography showed the right renal pelvis to be displaced far into the left upper quadrant of the abdomen so that it lay farther to the left than the left renal pelvis. Upon opening the abdomen, the presence of an enormous lobular fatty mass filling the abdomen was confirmed. It weighed 26½ pounds. The left kidney was in normal position. The primary incision was begun at the left of the ensiform, made diagonally downward to the right, and terminated at the right flank. An additional left transverse incision was made. The renal pedicle was first clamped and tied, and the tumor was delivered. Five yards of 3 inch gauze strip was used to fill the enormous dead space. The incision was closed with through-and-through interrupted alloy wire sutures and interrupted fine stainless steel for the fasciae. The pathological report stated that "the gross specimen consists of tumor and kidney. The tumor is encapsulated and coarsely lobulated, approximately spherical in shape and 37.0 cm. in diameter. Its weight is 26½ pounds. On cut surface it consists largely of fat and fibrous connective tissue in varying proportions. In some parts the fat predominates, and in others the fibrous connective tissue predominates. The kidney is compressed and distorted. It is also atrophic. Its weight is 90 gm. The cortex is thin and averages 0.2 cm. in thickness. The medullary substance is approximately 0.5 cm. in thickness. The pelvis is compressed, and the kidney is probably nonfunctioning due to pressure. Study of several sections taken from different places in the tumor shows the tissue to consist of fat cells and fibrous tissue with the latter type predominating. There is no evidence of malignant change. Further search will be made by studying additional sections from other areas and if diagnosis is changed, supplemental report will be made. Diagnosis: fibrolipoma, abdominal, benign."

The patient was discharged on the seventy-second day after a stormy convalescence complicated by low serum protein, for which human serum and amino acids were administered. Certain physiological alterations merit comment, such as the edema, which was due to (1) pressure of the tumor upon the vena cava resulting in venous stasis distal to the point of compression, and also (2) nutritional depletion caused by growth of the fibrolipoma at the expense of the remainder of the body and so contributing to the reduction of the total serum protein.

DAVID ROSENBLOOM, M.D.

**Moore, T.: The Retrograde Movement of Ureteral Calculi.** *Brit. J. Urol.*, 1946, 18: 60.

The author briefly refers to the literature, and describes in detail Legeue's case in which the calculi were so extremely mobile that he placed the patient in the Trendelenburg position, shook him, clamped the upper ureter to prevent the stones from falling back into the ureter, and then extracted the calculi from a renal calyx.

The case reported is that of a 22-year-old male with two stones which moved from the ureter to a renal calyx during the preliminary radiographic examinations. At operation the lower ureteral stone was extracted through a paramedian abdominal incision with the thought that the other stone could be milked down the hydroureter and removed through

the same ureteral incision. After the first stone had been removed, the second was found not to be palpable. The ureter was then plugged, and with a renal incision the renal stone was removed from a renal calyx. The sizes of these stones were ¾ inch and ½ inch.

The need of x ray localization of ureteral calculi immediately before surgery is emphasized. Retrograde passage of ureteral calculi is dependent upon antiperistalsis or gravity. ROBERT LICH, JR., M.D.

**Orofino, A.: The Histopathological and Pathogenic Study of Chronic Pericystitis, with Special Regard to the Lesions of the Terminal End of the Ureter** (Contributo allo studio istopatologico e patogenetico delle pericistiti chroniche con speciale riguardo alle lesioni del tratto terminale dell'uretere). *Arch. ital. urol.*, 1945, 21: 139.

Anatomically, the urinary bladder is found to be surrounded by fibroserous connective tissue, which in part is covered with pelvic peritoneum. Smooth muscle is found at the terminal end of the ureter, which aids the opening and closing of the mouth of this organ.

Chronic pericystitis may be subdivided into two types: (1) pericystitis of bladder origin, and (2) that of extrabladder origin. In the latter type, inflammation of the adjacent organs or, in some cases, remote infection are the principal causes; this may spread either by direct extension or through the lymphatics. Pericystitis may be caused by attacks of appendicitis, typhilitis, sigmoiditis, proctitis, epididymitis, prostatitis, and colitis.

Pathologically, two forms of pericystitis are present, the edematous and the sclerolipomatous. The edematous form is similar to pelvic cellulitis; it involves the terminal end of the ureter and results in an obstruction. The sclerolipomatous form is characterized by fibrotic tissue interwoven with adipose lobules, and a hypergenesis of collagenous fibers with a decrease of cellular elements. This fibrotic process also involves the terminal end of the ureter and produces obstruction. The nerve supply to the bladder may also be affected by the edema or the fibrolipomatous change and may give rise to disturbances of bladder contraction and the painful crises that accompany it. Unless the anatomy and pathology of pericystitis is understood, great diagnostic difficulties in establishing the true nature and site of the lesion are encountered. ARTHUR F. CIPOLLA, M.D.

## BLADDER, URETHRA, AND PENIS

**Niceley, E. P.: Gunshot Wounds of the Urinary Bladder in Wartime.** *J. Urol.*, Balt., 1946, 56: 59.

Eleven cases of vesical injury are discussed; 1 of an extraperitoneal wound, 4 of intraperitoneal wounds and an associated injury of the abdominal viscera, and, in addition, 4 of wounds of the bladder and rectum and 2 of vesical damage alone.

These cases present symptoms which vary with the size of the vesical opening, associated injury, and the length of time before the diagnosis is made. Intraperitoneal lesions present signs of shock in addition to urinary symptoms of vesical tenesmus, pain over the bladder region, urinary retention, or hematuria.

The diagnosis can be made readily when there is a large opening in the bladder by using the method of introducing fluid and noting the amount recovered, but in smaller lesions cystography is often the most useful method, either with air or a halogen contrast media. Very small lesions can be most readily diagnosed by cystoscopy, but when an exploratory laporatomy is done cystoscopy may not be necessary.

An exploratory operation should be executed immediately after the diagnosis is made and the primary shock is controlled. The bladder should be opened, the openings repaired, and a cystotomy tube of large caliber left in place; the urethral catheters are removed. Ureteral catheters may be introduced into the renal pelves to keep the operative site free of urine. When intraperitoneal damage is associated the peritoneal cavity is opened, the necessary repairs are executed, and the urine is removed; closure is made without drainage. In combined vesical and rectal perforation both a cystotomy and a colostomy are to be done to divert both the urine and feces from the repaired area. The important factor in treatment is that the cystotomy tube be kept open and free of clots so that intravesical pressure cannot be exerted at any time.

The prognosis in these patients is considered good provided that the diagnosis is made soon after injury and proper treatment is executed. In the opinion of the author, complete recovery in a simple gunshot wound of the bladder may be anticipated in from 4 to 6 weeks after the time of injury.

ROBERT LICH, JR., M.D.

**Cortese, G.: Value of Urethrography in Male Genital Tuberculosis** (Valore dell'uretrografia nella tubercolosi genitale maschile). *Arch. ital. chir.*, 1945, 67: 284.

Urethrographic studies in 17 cases of external genital tuberculosis in man enabled the author to establish the presence of involvement of the bladder or of the prostatic gland, while the clinical examination alone failed to reveal such involvement. In several instances the rectal examination disclosed prostatic and vesicular lesions while the roentgenograms furnished negative results. Conversely, in other cases the rectal exploration failed to show any pathology while the urethrograms demonstrated complete destruction of the prostatic gland.

Urethrographic studies should be supplemented by laboratory tests, such as cultures of the prostatic secretion, biologic tests, and search for tubercle bacilli in stained specimens.

Urethrographic studies are of great value for following the evolution of the deeply located genital tuberculosis and for the evaluation of its treatment.

JOSEPH K. NARAT, M.D.

## GENITAL ORGANS

**Higbee, D. R.: Benign Prostatic Obstruction.** *J. Urol.*, Balt., 1946, 56: 83.

The author compares the 3 types of prostatectomy in a series of consecutive cases done under spinal anesthesia.

In the group of 100 suprapubic prostatectomies 79 were two stage operations and 21 single stage procedures. The mortality in this group was 5 per cent and was limited to the two stage group. Of the 5 patients who died in this group 2 did not survive cystotomy; 2 deaths were due to a postprostatectomy septicemia, and 1 death followed a large pulmonary embolus.

In the group of transurethral resections the mortality was 4 per cent. Three deaths in this group were due to heart failure, and 1 was due to a septicemia following the removal of vesical calculi and prostatic resection.

The perineal group consisted of 100 patients with a mortality rate of 3 per cent. There were 3 deaths in this series; 1 due to heart failure, 1 to pulmonary emboli, and the last to carcinoma of the cecum.

The morbidity rate due to complications in the suprapubic group was 28 per cent as compared to 8 per cent in the transurethral group and 12 per cent in the perineal group. The average length of hospital stay was greatest in the suprapubic group and shortest in the transurethral group. However, in the patients suffering complications the hospital stay was 45 days for the suprapubic group, 32 in the transurethral group, and 28 days in the perineal group.

In reviewing the end results obtained after the 3 methods of prostatectomy there seems to be little difference. In short, then, the 3 methods may well be expected to give low morbidity and mortality rates and fulfill the purpose of surgery, namely, permanent symptomatic relief. ROBERT LICH, JR., M.D.

**D'Agata, A.: Biologic Reaction in 2 Cases of Tumor of the Testicle—Friedmann's Reaction** (Reazione biologica su due casi di tumore del testicolo—Reazione di Friedmann). *Sperimentale*, 1946, 98: 72.

Two tumors of the left testicle are reported, one in a 31 year old laborer and the other in a 32 year old laborer. In both, the neoplasm appeared without history of trauma, and grew rather rapidly. There was no evidence in either patient of hereditary taint or of other disease, except that there was a positive Wassermann reaction in 1. In both patients the Friedmann reaction was positive before the testicle was removed. In one the reaction became negative a few days following the operation, but a month later it had again become positive, coincident with the development of pain in the lumbar region and the appearance of what seemed to be metastasis in a lymph gland of the lumboaortic region. This suggests a prognostic value for the Friedmann reaction in this condition. In the other patient the reaction remained positive throughout.

The biologic reaction was also noted immediately upon removal of the tumor and the subcutaneous implantation of small pieces, and upon the intraperitoneal injection of triturated suspensions of the tumor; in the first patient cited, the reaction proved negative for the implantation but positive for the intraperitoneal injection; in the second case the reaction was positive in both instances.

Both tumors were diagnosed histologically as seminomas. However, the positive Friedmann reaction showed that there may also have been present some elements of a teratoma with the inclusion of chorioepitheliomatous cells, and in the second case cited the microscopic picture of some fields exhibited structures strongly suggestive of Langhans cells. The author, therefore, leans toward the view that these tumors are unilateral developing teratomas of the testicle. JOHN W. BRENNAN, M.D.

# SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

## CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

**Wertheimer, L. G.: Limitation of Movement of the Scapulohumeral Joint by a Muscle Anomaly** (Limitação dos movimentos da articulação escápulo-humeral por anomalia muscular). *Rev. Hosp. Clin.*, 1946, 1: 191.

It is very rare for the movement of the shoulder joint to be limited by the presence of an anomalous muscle. The author describes such a case in a young man of 20 years. The right anterior axillary fold was very abnormally developed, extending to the middle of the arm when the arm was abducted. In addition to this deformity the patient presented dorsal scoliosis and absence of the palate. His mind was normal. Examination of the right side showed a chondroepitrochlear muscle, apparently with two muscle bundles uniting in a tendon which passed to the epitrochlea. On the left side there was a similar but much smaller muscle. The chondroepitrochlear muscle on the right side was found to react to electrical stimulation of the brachial plexus. There were no qualitative or quantitative abnormalities in the reaction. The pectoralis major muscle was much smaller than normal. It also reacted to electrical stimulation but the contractions were rather weak.

Operation was performed on the right side for the purpose of freeing the movements of the shoulder.

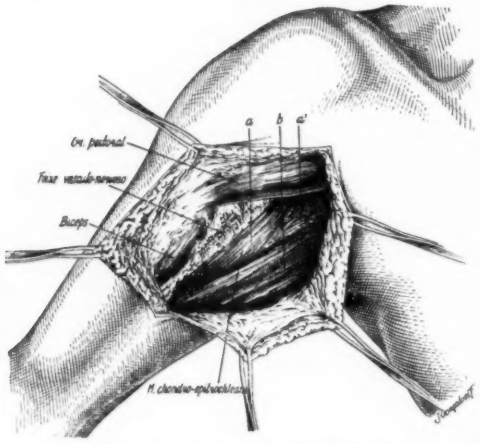



Fig. 3. (Wertheimer.) Turning back the skin flap and sectioning the aponeurosis, it is found that the chondroepitrochlear muscle presents a lateral bundle which at the upper end is divided into two bundles, a and a′, and a median bundle b′ which is directed toward the thorax. The vasculonervous bundle of the arm is seen between the biceps and the chondroepitrochlear muscles. The pectoralis major muscle is seen to be very small.

On sectioning the two muscle bundles felt on palpation a third bundle was found beneath them. The two superficial bundles were sutured to the lower surface of the tendon of the pectoralis major and the third shorter one was fixed to the middle of the other two. Immediately after the operation the arm could be lifted to maximum anteflexion. A thoracobrachial cast was applied in a position of hypercorrection. This operation not only restored normal movement of the arm but the action of the pectoralis major was strengthened by the attachment of the muscle bundles to it. AUDREY G. MORGAN, M.D.

**Billing, L., and Ringertz, N.: Fibro-Osteoma, a Pathologicoanatomical and Roentgenological Study.** *Acta radiol.*, Stockh., 1946, 27: 129.

This study undertakes to clear up some questions on the pathology of fibro-osteoma, and stresses the possibilities for roentgenological diagnosis. A survey of the literature is made, although the great variation in nomenclature makes evaluation of the cases difficult.

Most of the benign tumorlike new formations of bone in the skull may be grouped as a pathological entity, but the great variation in tissue maturation makes them differ widely in pathological appearance. The term fibro-osteoma is used to define lesions having a distinct anatomical connection with the skeleton, and in which there is a ground substance of connective tissue containing clumps and spicules of bone tissue. The relative cellularity, vascularity, and maturity of the involved tissues vary so that the tumors range from the soft, predominantly fibrous, to the eburnated osteomas. No cartilage is found in these tumors, which fact distinguishes them from osteocartilaginous exostoses.

A series of 25 cases is presented in a tabular survey, and the discussion stems from the findings in these. Photomicrographs illustrate the stages of maturity of tissue described in various individual lesions or even combined in the same tumor. Regressive changes often occur in the more mature type of tumors with osteoclasis in part or all of the lesion. When the bone-dissolving process is terminated the giant cells disappear and only a fibrous mass remains.

The anatomy is best demonstrated by roentgenograms of thin slices of tumor, because photomicrographs are marred when other parts lie over the tumor. The lesions may be localized, solitary, or multiple, causing swelling of a part of a cranial bone or of the entire bone, and when several bones are involved the suture lines are obliterated. In some projections it is possible to show the thin cortical shell delimiting the mass.

The jaws are sites of predilection, the frontal sinus and ethmoidal area also being common locations. In diffuse involvement the condition may be unilateral or include the entire face and anterior skull.

The most common types of importance for clinical and roentgenological diagnosis are divided into 4 classes and described in detail. All occur chiefly in youth with active growth about puberty, and produce symptoms of a mechanical nature due to deformity of the bone. Retardation of growth is often spontaneous, and when tumor tissue is of a "mature" type there is rarely recurrence after simple removal. Malignant degeneration is not unusual, but the tissue may be mistaken for osteogenic sarcoma and intensive irradiation may result in sarcomatous degeneration.

As to the pathogenesis, fibro-osteoma is probably not a true neoplasm but a growing malformation similar to the embryonal development of membrane bone. One case in a rib is noted with roentgen and pathological findings identical with the cranial type of fibro-osteoma. The osteoid osteoma of Jaffe is recognized as being pathogenetically dissimilar.

FRANCES E. BRENNECKE, M.D.

**Rosh, R., and Raider, L.: Primary Malignant Bone Tumors.** *Am. J. Roentg.*, 1946, 56: 75.

Of the 235 cases of primary malignant bone tumor seen in the Radiation Therapy Department at Bellevue Hospital in the past 20 years, 114 were too advanced for any treatment. The 121 treated cases fell into the following groups (Classification of Registry of Bone Sarcomas, American College of Surgery): (1) osteogenic sarcoma, 45 cases; (2) chondrosarcoma, 8 cases; (3) endothelioma, 32 cases; (4) multiple myeloma, 18 cases; and (5) giant cell sarcoma, 18 cases.

Fig. 2. (Rosh and Raider.) Original roentgenogram showing osteocartilaginous tumor, the margins of which are still intact.

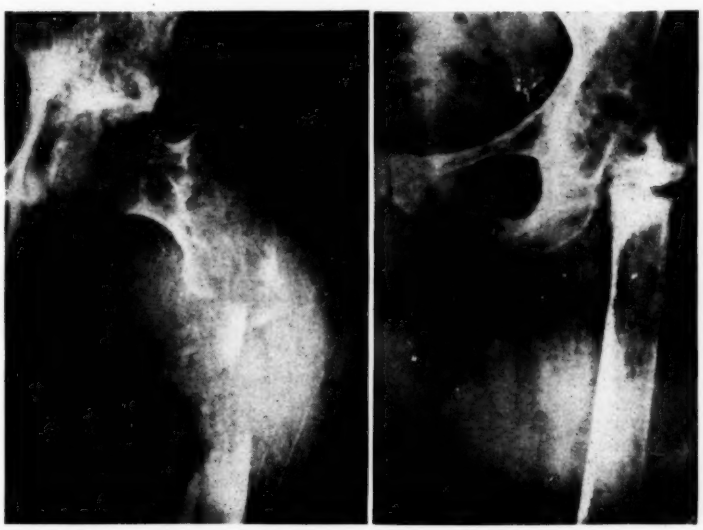


Fig. 1. (Rosh and Raider.) Osteogenic sarcoma. Left, Appearance at time of admission, showing destructive lesion of the upper third of left femur. Right, Following radiation therapy, showing regeneration of bone.

Fig. 3. (Rosh and Raider.) Chondrosarcoma, appearance at last admission.

In spite of controversy on the value of irradiation therapy, the impression remains that the best hope of cure lies in the combination of intensive irradiation and surgery. The tumors are radiosensitive in the following order: endothelioma, multiple myeloma, giant cell sarcoma, osteogenic sarcoma, and chondrosarcoma. The procedure of working up each case is outlined together with the technique of irradiation.

Twenty-two of the 45 cases of osteogenic sarcoma occurred in patients under the age of 20 years. In the following two decades there were 5 and 3 cases, respectively; there were 18 cases, more of the osteolytic type, among the patients more than 40 years of age. Most of the cases (31) had metastases, and were therefore treated by irradiation only. In 14 cases excision also was done, with 6 survivals for 1 year, and 4 for 5 years. Of the 3 patients who underwent amputation after irradiation 2 survived 3 years, and 1, 5 years. Coley's serum appeared to make no appreciable difference in the results.

Chondrosarcoma, which may arise primarily or in a pre-existing chondroma or osteochondroma, was found in 8 patients. Three of these survived more than 5 years, and all of them died of pulmonary metastases. Again, intensive irradiation followed by excision or amputation, when feasible, was the method of treatment.

Endothelial tumors known as Ewing's tumors metastasize early and rapidly to the lungs, lymph nodes, and the skeletal system. Of the 32 patients with this condition, 20 were under 20 years of age, and only 1 was known to be a survivor after 5 years. Although the irradiation may be used diagnostically, the prog-

Fig. 4. (Rosh and Raider.) Giant cell sarcoma. Left, Shows destructive lesion expanding the bone with dissolution of the cortex medially. Right, Same case, 6 months later following irradiation therapy, shows regeneration of bone.

nosis is poor, since not over 10 per cent of the patients are permanently cured by the best of treatment.

Multiple myeloma is invariably fatal, and the "punched out" areas of osteoporosis are often the site of pathological fractures. Irradiation is palliative, often permitting fractures to heal and yielding symptomatic relief. Of the 18 patients with this condition only 7 survived 3 years.

Giant cell sarcoma is not particularly radiosensitive, but it yields the greatest percentage of cures to radiation therapy. Excision and radiation are the authors' preferred treatment, and there may be complete regeneration of the bone following such therapy. Of 18 patients, 6 underwent excision and irradiation treatment and of these, 4 were alive and well 3 years later. Four patients received irradiation treatment only, and of these, 3 were well after 3 years.

Early recognition of malignant bone tumors followed rapidly by intensive treatment offers a good chance of permanent cure. The radiation therapist is of increasing importance in making the diagnosis and then prescribing and giving the irradiation therapy. FRANCES E. BRENNECKE, M.D.

## SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

**Lattes, R., and Frantz, V. K.: Absorbable Gauze in Bone Surgery.** *Ann. Surg.*, 1946, 124: 28.

This is a report of a series of experiments in which oxidized cellulose (absorbable gauze), fibrin foam, and absorbable gelatin sponges were placed in cortical cavities or between the fragments of fractured bones of dogs.

By using the three substances in adjacent ribs of the same animal, individual variations in tissue reactions were eliminated as a source of error.

Osteogenesis was markedly retarded by the presence of absorbable gauze, but fibrin foam or absorbable gelatin permitted healing almost as rapidly as that seen in control defects.

This interference with bone healing by absorbable gauze, whether it was placed in cortical defects, fracture lines, or in a bone from which a segment had been removed, suggested to the authors that it may be a valuable material for use in arthroplasties. Preliminary trials in this work have been encouraging. NEWTON C. MEAD, M.D.

**Snedecor, S. T.: Bone Surgery of the Hand.** *Am. J. Surg.*, 1946, 72: 363.

A series of 10 cases in which various types of bone surgery accomplished an improvement of function in severely deranged hands are presented with excellent illustrations. Bone surgery was not undertaken unless it would assuredly restore added usefulness to the hand, and was always considered in relation to the condition as a whole. Surgery of the bones cannot be performed on the hand through scar tissue. Good skin with subcutaneous tissue was a prerequisite for this work. Occasionally, nerve grafting or neurolysis was performed earlier or at the time that the bone work was done.

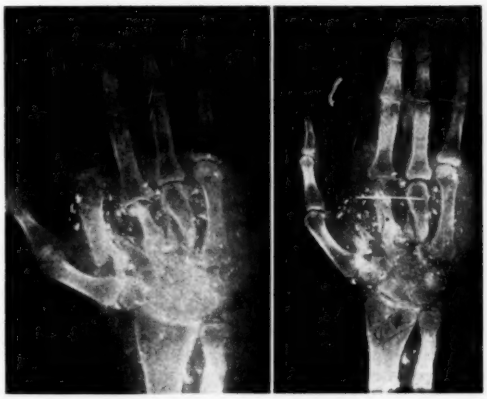


Fig. 1. (Snedecor.) Left, Useless remnant of index finger with loss of head of second metacarpal; apparent nonunion of the metacarpal but at operation it was found to be firmly united; right, removal of second metacarpal and transplant of distal half of fifth metatarsal onto shaft of third metacarpal after restoration of joint space. (Courtesy of American Journal of Surgery.)

A few cases with loss of thumb function were treated successfully. In 1 case in which the first metacarpal was gone, surgery consisted in the transfer of a useless metacarpal (the phalanges had previously been amputated) over to the thenar side and into the greater multangular. In instances in which this metacarpal was not available a tibial graft was occasionally used. There were instances in which the opposing action of the thumb was lost. In 1 case there was destruction of the thenar muscle with dense scar contracture. This problem was solved by freeing the scar and bringing the thumb around in an opponens position. A small bone block was taken from the tibia to hold it. This was wedged down between the first and second metacarpals and held in place by a Kirschner wire. In another case in which opposition of the thumb was lost because of scar tissue contracture, the thumb and remaining fingers possessed fair flexion and extension power and after the scar was freed an osteotomy was performed at the base of the first metacarpal and the shaft was rotated. This permitted it to move into a position of opposition to the index finger when a subsequent tendon transplant was made to motivate it. In cases in which the first metacarpal base was dislocated up into the wrist, reduction was difficult but the condition was corrected by fixation with Kirschner wires which were removed within 5 or 6 weeks.

In malunion of the metacarpal fractures, particularly in the cases in which the metacarpal heads had dropped forward, the whole intrinsic muscle mechanism of the fingers was thrown out of gear. Severe extension contractures of the

metacarpophalangeal joints developed and at operation it was often necessary to do a capsulectomy on the collateral ligaments of these joints in order to obtain 90 degrees of flexion. Fixation was accomplished by running Kirschner wires through the heads of several metacarpals to hold them up in place until healing occurred. Postoperatively, the metacarpophalangeal joints were maintained in a position of 90 degrees flexion for 2 or 3 weeks in order to prevent the recurrence of these extension contractures. At the same time active use of the phalangeal joints was encouraged to prevent stiffness of the fingers.

The closer to the normal length the metacarpals could be restored, the better was the ultimate function of the hand. Preliminary skeletal traction was found useful in accomplishing this. A bone graft was inserted subsequently. The problem of solving the loss of a metacarpophalangeal joint of an important finger was accomplished in the case of a blind officer whose finger function was truly important. The index finger was already missing so that its metacarpal stump had to be removed to eliminate scar tissue and make a smooth cleft between the thumb and middle finger. The space formerly occupied by the head of the third metacarpal was filled with dense scar tissue which had to be meticulously dissected out; a soft tissue covering was then prepared. The distal half of this third metacarpal was then borrowed for the graft and was notched into the proximal end of the metacarpal and fixed with a Kirschner wire. This single contact graft grew perfectly and the joint moved well. The flexor tendon had remained intact. Later, after union of the graft and motion in the joint had been well established, an extensor tendon graft was added and the finger functioned very well.

Cases were described in which the metacarpals were shifted to replace the loss of more important bones. In 1 case the distal end of the fourth metacarpal was missing and the finger was without nerve and tendon supply. This finger was sacrificed, and the fifth finger was moved over to take its place by the shifting of its metacarpal over to the base of the fourth.

Numerous arthroplasties of the metacarpophalangeal joints were successful. The base of the first phalanx in 1 case was trimmed up neatly and the sleeve mechanism around it was adjusted. In other cases the deformed heads of the metacarpals were replaced. C. FRED GOERINGER, M.D.

**Möllerud, A.: A Case of Bilateral Habitual Luxation in the Posterior Part of the Shoulder Joint.** *Acta chir. scand.*, 1946, 94: 181.

The author describes a case of bilateral habitual luxation of the posterior part of the shoulder joint. A comparison is made with 2 other cases of posterior luxation of the shoulder, reported respectively by Asplund and Sjövall.

The case was that of a domestic servant aged 18 who complained that she felt her shoulder slip as if the arm had gone out of joint when she performed certain movements. There was no pain but she noted that the arm got tired, particularly during heavy work which involved constant luxation and reposition. She had noticed this for several years in the left shoulder and approximately 2 years in the right.

In the case described by Sjövall the patient was a powerfully built man aged 22 who by stretching the arm forward and upward during inward rotation could constantly produce backward luxation of the limb. Asplund's patient was a young man aged 18 in whom backward luxation of the shoulder joint could be produced by abducting the right arm to about 50 degrees, then stretching it forward during simultaneous inward rotation. This was true of both shoulders. In the former's case roentgenograms were negative, but in the latter's, they revealed flattening of the posterior part of the glenoid cavity, while arthrography indicated an insufficiency of the capsular apparatus and an abnormally large posterior recess. These findings were verified at operation.

In Möllerud's case the mechanism of the subluxation was thought to be as follows: the more the arm approached the described position of upward and forward extension with simultaneous inward rotation, the more favorable were the conditions for posterior luxation. The outward rotators which brace and support the capsule posteriorly would be lax since the antagonists were in action and the tendon to the caput longum of the biceps, which acts as an intra-articular supporting ligament, would make the least resistance to a backward movement of the caput humeri. On the other hand, outward rotation would hinder luxation. The outward rotators would then presumably be somewhat supported and with them the posterior part of the capsule, even if it were abnormally slack.

Concerning the etiology, it was believed that the condition was one of capsular insufficiency of congenital origin with abnormal laxity of the shoulder joint capsules, which allowed the subluxation to occur without trauma or defect in the capsule. This viewpoint was supported by the fact that the occurrence was bilateral. In Möllerud's case the luxation could be brought about without inward rotation, in contrast to the cases described by Sjövall and Asplund. In their cases the inward rotation was required in order to produce luxation. Accordingly, Sjövall concluded on the basis of x-ray examination and postmortem experimental findings that the mechanism of luxation was as follows: on elevation and inward rotation of the arm the tuberculum minus thrusts against the glenoid cavity so that the caput humeri is pushed out of the socket and at the same time glides backward. In order that this may occur, the capsule of the joint must be abnormally lax, especially in the posterior part. Thus, in postmortem experiments it was necessary to cut entirely through the capsule before luxation could be produced. In Möllerud's case the condition caused only slight inconvenience and operative treatment was not carried out. C. FRED GOERINGER, M.D.

**Freiberg, J. A.: Experiences with the Brittain Ischiofemoral Arthrodesis.** *J. Bone Surg.*, 1946, 28: 501.

The rather high incidence of failure of osseous fusion following the use of standard iliofemoral operations, especially in the tuberculous hip, has been due to the distraction effect of the adductor muscles on the superiorly and laterally placed graft and in some cases to the presence of diseased bone in the superior portion of the acetabulum.

Brittain has pointed out that the mechanical strength of the ischiofemoral strut graft, placed inferior to the hip joint, is superior to that of the flying buttress graft of the iliofemoral type. The former graft heals under compression force, while the latter must heal under tension; the force in both instances is supplied by the adductor muscles of the hip and thigh.

The basic principles of the Brittain ischiofemoral operation are simple. An adequate, rigid tibial graft must be firmly implanted in healthy pelvic bone. The proximal end of the distal femoral segment must be displaced medially to the ischium, so that new bone need not develop across the dead space bridged only by the graft. Uniform contact between the cut surfaces of the femur and the graft ensures moderate immediate fixation, early healing, and maintenance of the original operative position. In patients with tuberculous lesions, the osteotomy should be done at a level and at an angle which will allow the graft to be embedded in bone not involved in the infectious process. The angle of osteotomy should vary according to the specific relations of the damaged hip joint, from the transverse plane to an angle of 45 degrees.

The indications for the Brittain ischiofemoral arthrodesis are multiple. The contraindications occur in those instances in which the diseased bone cannot be short-circuited by means of the osteotomy and graft.

The author performed 7 Brittain ischiofemoral arthrodeses in a period of 7 months and waited 6 months to determine the results in these cases prior to continuing this procedure. End-result studies are reported only for these 7 patients operated upon from 13 to 20 months previously.

Among 6 patients with tuberculous hip joints upon whom the Brittain ischiofemoral arthrodesis was performed, osseous fusion developed in 4 within from 7 to 9 months. In 1 case, with postoperative extraneous complications, fusion is apparently taking place after 1 year. In 1 adult, a painful, disabling traumatic arthritis of the hip was healed by osseous fusion in 4 months. Additional patients upon whom this operation has been performed are showing every evidence of a similar high percentage of osseous fusion.

The Brittain ischiofemoral arthrodesis ideally combines an intertrochanteric osteotomy which allows temporary joint rest and an inferiorly placed strut graft; healing occurs under compression stresses, rather than tension stresses as in the iliofemoral operations.

RUDOLPH S. REICH, M.D.

**Blair, H. C., and Morris, H. D.: Conservation of Short Amputation Stumps by Tendon Section.** *J. Bone Surg.*, 1946, 28: 427.

The stump length of the forearm is measured from the insertion of the biceps tendon to the bone ends of the stump. The minimum stump length allowing the fitting of a forearm prosthesis and furnishing enough leverage to activate it is 1½ inches.

When the elbow is flexed against resistance, the biceps stand out, and, similarly, when the knee is flexed, the hamstrings become prominent. The effect is to crowd the prosthesis off the short stump; this inhibits the use of the prosthesis in flexion, especially in the upper extremity. The authors have found that by excising 1 inch of the biceps tendon at or near its insertion, approximately 2 inches in length of useful stump are gained. In short, below the knee stumps, excision of the fibula and section of the medial and lateral hamstrings allow a gain of approximately 2 inches of useful stump length. A functional stump length of 1½ inches below the knee joint is usually considered the shortest which will allow the proper fitting of an artificial limb.

The authors have carried out the procedures described on 10 short forearm stumps and on 22 short below the knee stumps. Only 1 patient required reamputation at a higher level because of a severe flexion contracture of a below the knee stump. All other patients were fitted satisfactorily with prostheses.

VERNON C. TURNER, M.D.

## FRACTURES AND DISLOCATIONS

**Maronneaud, P. L.: Fractures of the Inferior Maxilla and Indications for a New Surgical Method of Treating Fractures: Osteosynthesis with Kirschner Wire** (Considérations sur les fractures du maxillaire inférieur et les indications d'un nouveau moyen chirurgical de contention: le brochage). *J. med. Bordeaux*, 1946, 123: 201.

Holding of the bony fragments in fractures of the symphysial region of the lower jaw bone by transversely placed and crossed Kirschner wires has already been described by others; however, the author places the wires longitudinally along the ramus of the jaw and also uses the method for fractures of the angle and ascending ramus of the mandible.

The technique consists simply of placing a wheal of local anesthetic at the mandibular symphysis, denuding the bone for a distance of 1 cm., and passing the Kirschner wire backward within the substance of the horizontal ramus between the dental canal above and the lower edge of the jaw bone below. Upon reaching the fracture line the wire passes on into the posterior fragment, which is maintained in place by an assistant. If, however, assurance of the correct alignment of the fragments is desired, a preliminary wiring of the fragment, or fragments, to the superior maxilla (homomaxillary splinting) is done, and this is removed after the Kirschner wire has been placed. The jaw is then simply bandaged, or a plas-

ter splint is applied externally to immobilize the mandible. The method assures perfect reduction, gets rid of the unpleasantness of the continuous mandibulomaxillary occlusion, permits a moderate amount of precocious mobilization (so favorable to callus formation), shortens the period of healing, and does not require a secondary surgical intervention for removal of the apparatus of osteosynthesis.

The author does not wish to identify his method with the popular method of intramedullary pinning, which is not applicable to fractures of the mandible because of anatomical considerations.

JOHN W. BRENNAN, M.D.

**Compere, E. L., and Schnute, W. J.: Treatment of Congenital Dislocation of the Hip.** *J. Bone Surg.*, 1946, 28: 555.

The most common cause of poor results in the treatment of congenital dislocation of the hip in children under 4 years of age is discontinuance of immobilization before an adequate hip joint is clinically and roentgenographically demonstrable. To be acceptable, the depth and slope of the superior acetabulum must be relatively normal, and the femoral head and acetabulum must fit accurately and articulate smoothly.

To avoid long periods of plaster immobilization, most surgeons have discontinued splinting when the hip joint seems stable. The hip joint may not redislocate, but marked inadequacy of the acetabulum results in disability and possible redislocation later in life.

As the orthodontists reshape bones of the jaw by gentle pressure over long periods of time, so the acetabulum and femoral head may be reshaped by months or years of corrective pressure. Fat and fibrous tissue obscuring the acetabulum will absorb if pressure is maintained long enough. To this end the authors use a modified Denis Browne splint with a long bar between the footplates to maintain abduction. This secures the constant pressure of the femoral head in the acetabulum without rigid immobilization. The patient is able to sit up, and may be taken out of the splint for bathing and graduated periods of freedom.

The routine of treatment as used for the past 3 years on 16 patients under 4 years of age, is outlined:

Position 1: Frog leg cast in 90 degrees of abduction for 2 months.

Position 2: Abduction spica cast for 2 months.

Position 3: Bilateral long leg plaster casts held widely apart and in slight internal rotation by a plaster strut, for 2 months.

Position 3b: Denis Browne splint with long spreader bar for 2 months which is removed daily for the bath.

Position 3c: Same as 3b but the splint is left off 1 hour each morning and afternoon with an additional hour of freedom per day added each week. The splint is kept on at night until the hip presents normal contours roentgenographically.

The case studies are illustrated by photographs of the positions and by roentgenograms, but it is too early for an end result study. However, the authors believe that most congenital dislocations of the hip can be reduced, the reduction maintained, and a relatively normal joint developed by means of prolonged functional splinting.

FRANCES E. BRENNECKE, M.D.

# SURGERY OF THE BLOOD AND LYMPH SYSTEMS

## BLOOD VESSELS

**Barone, A. M.: Multiple Perthes' Test for Segmental Occlusion of the Deep Veins.** *J. Am. M. Ass.*, 1946, 131: 1406.

The author emphasizes the importance of determining the patency of the deep venous system before injection or ligation treatment of superficial varicosities. Perthes' test for occlusion of the deep veins bases its conclusions on the physiologic actions of the skeletal muscles of the leg during walking. Perthes' test consists of placing a tourniquet about the thigh just above the knee, sufficiently tight to compress the long superficial saphenous vein and prevent the reflux of blood into the distal saphenous system; the patient then walks vigorously or flexes and extends the knee repeatedly. The interpretation of the test is as follows: (1) if the varicosities collapse during the muscular activity, the deep veins are patent, and the test is reported as negative; (2) if the varicosities do not collapse but become more distended and the patient notices pain or cramps in the leg with activity, obstruction of the deep circulation is present, and the test is reported as positive.

A positive Perthes' test is sufficient proof of occlusion of the deep veins, but the author points out that a negative test may not always mean a competent deep circulation; such an instance may prevail in a segmental thrombosis. If an obstructing thrombus is present in a segment of a deep vein in the thigh, it is possible for the blood to make a detour around the thrombus by passing through a deep communicating vein below it into a superficial vein and then back into the deep vein through a communicating channel proximal to the thrombus. Therefore, an obstructing occlusion may be present in the deep vein and yet the varicose superficial veins will collapse on walking with a tourniquet above the knee (see diagram). In order to obviate such erroneous conclusions the author recommends the application of the tourniquet at 5 inch intervals from the knee to the groin as in this manner the level of the detour can be determined. Thus, if the varicosities below the tourniquet collapse every time the patient walks with the tourniquet at different levels, there is no segmental thrombosis, but if a level is reached at which the distal veins remain distended and become more distended, the tourniquet is constricting the detour level and preventing the flow of blood through the communicating vein into the superficial veins.

Cases which are suggestive of deep vein occlusion and therefore require the multiple Perthes' test are: (1) those with a history of thrombophlebitis or phlebothrombosis; (2) those with a history of trauma, especially fracture; (3) those with a suspicion of deep vein occlusion, as evidenced by pain and swelling; (4) those with phlebographic evidence of obstruction; and (5) those with an equivocally negative Perthes' test.

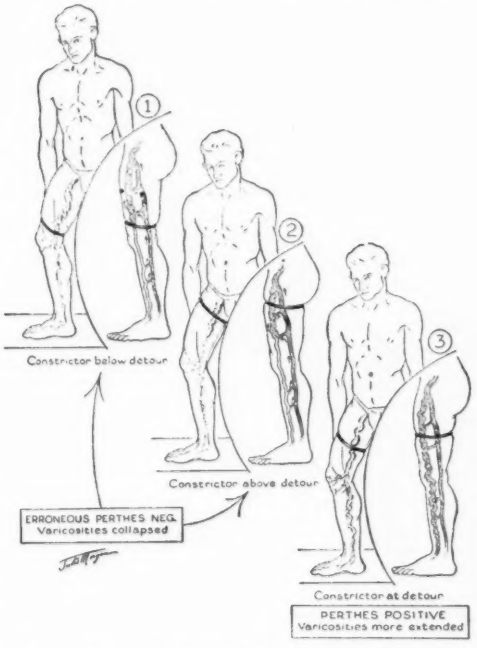



Fig. 1. (Barone.) Multiple Perthes test for segmental occlusion of deep veins.

The author emphasizes the necessity for ascertaining that the superficial venous dilatations are not compensatory to deep venous obstruction, as failure to observe this phenomenon before instituting surgical treatment will result in undesirable and critical complications. EDWARD H. CAMP, M.D.

**McGowan, J. M.: Cervical Rib; The Role of the Clavicle in Occlusion of the Subclavian Artery.** *Ann. Surg.*, 1946, 124: 71.

The author attempts to throw more light upon the syndrome of the cervical rib and scalenus anticus muscle. This study is derived from 9 cases of cervical rib, 3 of which required surgical treatment.

A review of the various theories presented in the past includes the theory of sympathetic hyperactivity from irritation of the sympathetic nerves which results in vasospasm. Jones, Todd, Telford, and Blair incriminated the cervical rib alone, although the predisposing factor of position of the shoulder girdle was recognized.

The importance of the scalenus anticus muscle was brought forth by Adson and Coffey, and later the scalenus anticus syndrome as an entity per se was emphasized by Ochsner, Gage, and DeBakey. Judovich has implicated a narrowing of the costoclavicular space, whereas Wright believed that the nerves and blood vessels were pinched between the first rib and the clavicle. Aynesworth included the cervical rib as well as the first rib and also mentioned the possibility of trauma to the subclavian artery from excessive movement of the shoulder.

The symptoms produced may be either vascular or neurological, or both. The former are blanching, numbness, tingling, cyanosis, and coldness, whereas the latter include radiating pain down the arm and occasionally into the neck and scapula, anesthesia, paresthesia and numbness, atrophy of the muscles supplied by the ulnar nerve, and finally, trophic disturbances.

The irritative and destructive signs are the result of pressure, stretching, or friction of the brachial plexus and blood vessels between a cervical rib, fibrous band, or the scalenus medius and posticus muscles posteriorly, and the scalenus muscle or clavicle anteriorly. The position of the ribs—either the cervical or the first thoracic—in relation to the shoulder girdle and the origin of the brachial plexus determine whether the structures will be put under tension, stretched, or pinched. If the rib is lateral, the structure will be pinched between the rib and the clavicle, particularly when the shoulders are thrown back. A medially placed rib will press against the scalenus anticus muscle. In this group of cases any maneuver placing the scalenus anticus muscle under tension will produce or aggravate the symptoms, especially obliteration or diminishing of the pulse.

In only 1 case with a medially placed cervical rib was the Adson maneuver positive. The remaining cases revealed an obliteration of the pulse in the arm but not in the third portion of the subclavian artery which lies distal to the scalenus muscle. Thus, the obliteration must have taken place where the artery passed between the cervical rib and the clavicle.

Mild cases may be alleviated by exercise tending to elevate the shoulder by strengthening the trapezius and levator scapulæ muscles and instructions should be given to the patient not to throw back the shoulders. If surgery is indicated the scalenus anticus muscle is severed and a portion of the cervical rib is removed. The author believes that anterior scalenotomy alone would not be sufficient; however, this procedure alone was not performed.

JACK I. WOOLF, M.D.

**Shumacker, H. B., Jr., and Carter, K. L.: Arteriovenous Fistula and Arterial Aneurysms in Military Personnel.** *Surgery*, 1946, 20: 9.

The study comprises 245 arteriovenous fistulas and 119 aneurysms observed at the Mayo General Hospital, Galesburg, Illinois. The signs and symptoms were those usually described in these conditions except for the absence of evidence of myocardial insufficiency in all but 2 patients. Generally the frontal cardiac area was demonstrably increased on roentgenographic examination in instances in which there was a large fistula, with the exception of lesions of the carotid vessels in which cardiac enlargement was usually absent. The correct localization of the aneurysm or fistula was generally easy and in only a few cases was an error in localization made. The most common difficulty arose in cases with lesions of the profunda femoral vessels in which the pulsation, bruit, and thrill could be eliminated only by compression of the overlying femoral as well as the involved profunda vessels. In other cases lesions of a branch close to the main artery were incorrectly localized to a larger vessel.

Arteriograms were useful in cases of intracranial aneurysm without bruit or thrill, in cases in which there was uncertainty regarding the exact localization of the lesion, particularly when tests showed the collateral circulation to be poor, and in cases in which it appeared that the aneurysm was being "cured" by thrombosis. In the great majority of cases it was found that arteriograms were unnecessary.

The distribution of the lesions involved all the major arteries of the body except the abdominal aorta and the common iliac arteries. Nine patients had multiple aneurysms and fistulas. The problem of treatment was often complicated by the presence of associated injuries such as fractures and damage to the peripheral nerves. Thirty-three and eight-tenths per cent of the arteriovenous fistulas were complicated by nerve injury. In about half of these operative treatment was required, such as neurolysis or neurorrhaphy. Sixty-one and three-tenths per cent of the arterial aneurysms were associated with nerve palsies of which two-thirds required operation. Most of the serious nerve injuries were associated with lesions of the great vessels of the upper extremity.

Of the various tests used for determining the adequacy of the collateral circulation in the limbs, the Matas reactive hyperemia test was found most reliable and practical. The absence of pulses distal to an aneurysm or fistula in a limb which had maintained good circulation also proved an indication of adequate collateral circulation. The most useful sign which could be elicited at the time of operation was the maintenance of good color and warmth of the hand or foot during a prolonged period of accurate occlusion of the involved segment of the artery with a rubber shod clamp.

Since one of the most important factors in the development of adequate collateral circulation in arteriovenous fistula is the duration of the lesion, operation was usually not performed until the lesion was of 4 months' duration or longer. The indications for early intervention were rupture (either external or subcutaneous), infection, severe myocardial insufficiency, and associated severe nerve paralysis. The authors believe that repeated occlusion of the involved artery hastened the development of adequate

collateral circulation. Sympathectomy was utilized extensively to increase the collateral flow, especially for axillary, femoral, and popliteal lesions. The results were generally good. However, the only limb in which gangrene developed immediately after excision of a fistula had been sympathectomized. Similarly, the only instance in which the ischemic paralysis followed operative cure of an aneurysm was one in which sympathectomy was performed at the conclusion of the operation.

The operative approaches were chosen to provide good exposure, but no incisions were used which followed the course of the vessels longitudinally across the axilla, the antecubital space, and the popliteal fossa, or which crossed normal skin creases of the neck and the groin.

Four operative methods were used for arterial aneurysms. When the sac was small and the neighboring nerves and vessels could readily be dissected free, the entire aneurysm was excised. Intrasaccular ligation of the artery without excision of the sac was employed primarily for large aneurysms not associated with peripheral nerve lesions. When the aneurysm was closely adherent to nerves which could not readily be freed from it beforehand, intrasaccular ligation of the vessels was followed by complete or subtotal excision of the sac. Proximal ligation of the affected artery was the method reserved for intracranial carotid aneurysms.

The operative technique usually used in the cure of arteriovenous fistulas was excision with quadruple ligation of the affected artery and vein together with ligation of branches which communicated with the fistula. In 33 instances the affected artery was preserved intact. Restoration of the artery was not feasible more often because the damage to the artery was often extensive, requiring excision of a portion which eliminated the possible use of such simple types of repair as ligation of the fistula or lateral suture. On the other hand, end to end suture or vein graft would have required the sacrifice of some important collateral branch, which the authors considered unwise.

Cure of the aneurysm or fistula was achieved in all but 1 case, a large saccular arteriovenous aneurysm involving the right innominate and left subclavian vessels along with the arch of the aorta and superior vena cava. The majority of the patients showed no evidence of circulatory insufficiency after operation while at rest or with moderate exercise about the wards. Nevertheless, weakness and fatigability were frequently demonstrable after operative ligation of a main artery to the upper extremity, and intermittent claudication was common after interruption of a major artery to the lower extremity. Sympathectomy was performed in 34 cases of this type with only partial alleviation of the symptoms.

In the 33 cases of repair of arteries there were 6 failures. The other 27 cases showed no signs of arterial insufficiency after operation.

Among the 288 patients operated upon by the authors there were 6 major complications: 2 fatalities, 2 cases of gangrene, 1 temporary hemiplegia, and 1 ischemic nerve paralysis.

THEODORE B. MASSELL, M.D.

**Elkin, D. C.: Cirsoid Aneurysm of the Scalp.** *Ann. Surg.*, 1946, 123: 591.

The author describes 4 cases of cirsoid aneurysm of the scalp encountered in the course of operations upon approximately 470 aneurysms and arteriovenous fistulas incident to wounds of warfare. When contributing arteries and outgoing veins form multiple anastomoses and become, in reality, a diffuse arteriovenous fistula, the term "cirsoid" is generally applied. In one of these reported cases, the condition arose in the site of a pre-existing telangiectasia involving the scalp and ear, and had as the more immediate etiological agent a long-continued irritation from wearing a helmet; the other 3 cases followed trauma to the scalp without any pre-existing vascular lesion.

Although methods of treatment are multiple, e.g., carotid ligation, multiple ligation of the lesion itself, obliteration with the galvanocautery, injection of sclerosing agents, and surgical excision, the last method was considered more certain of cure and was the method of choice.

All of the patients were treated similarly: the principal artery or arteries leading to the lesion were independently ligated as a preliminary step. A scalp flap, horseshoe in shape and including galea, was then reflected to expose the lesion from the under side. Hemostasis was secured by finger pressure and by independently ligating and dividing each vessel as it was encountered in the incision. The main vessels, including the central portion of the lesion, were completely excised from the under side of the flap which was then replaced with interrupted silk stitches in galea and skin. EDWARD H. CAMP, M.D.

**Moses, W. R.: Ligation of the Inferior Vena Cava or Iliac Veins.** *N. England J. M.*, 1946, 235: 1.

The author reviews the history of operative interruption of the inferior vena cava. In summarizing the literature on the subject in 1937, Krotoski collected 48 cases of ligation of the vena cava, performed by 27 operators. In 1944 Homans reported 14 cases of surgical interruption of the iliac vein for venous occlusive disease of the lower extremities.

Whether medical or surgical therapy will prove to be the more satisfactory solution for the problem of treatment of pulmonary embolism depends on the information to be gleaned from several more years of experience. The evaluation of any therapeutic approach to the problem of phlebothrombosis must of necessity await the clarification of the diagnosis of its presence. Phlebothrombosis resembles no other disease so closely as it does cancer in that the most significant phase of the disease occurs during the period when the diagnosis is the most obscure.

The following indications on which the decision for ligation of the vena cava may be based have been tentatively accepted by the author: thrombophleb-

itis of the pelvic veins with pulmonary emboli; pulmonary embolus associated with prostatic tenderness of recent or presumably recent origin, especially with demonstration of deep tenderness along the anterolateral region of the rectum; reasonably conclusive evidence of pulmonary infarcts the source of which remains obscure despite diligent search; and venous occlusion of the lower extremities that would otherwise be treated by interruption of the femoral vein alone. The conditions governing the last are as follows: cellulitis or lymphangitis of the upper thigh, infections of the groin, or the finding of enlarged and tender inguinal or femoral triangle lymph nodes; recurrent emboli following bilateral ligation of the femoral veins; femoral phlebothrombosis with tense edema extending above the knee; the operative finding of adherent clot on exposure of the femoral vein; and acute thrombophlebitis extending into the upper thigh clinically, with the presence of pulmonary embolism.

In the prevention and therapy of pulmonary embolism, ligation of the inferior vena cava is related to interruption of the femoral vein not as a substitute but rather as a complement. The medical literature is replete with sizable case series proving that femoral ligations are safe, simple, and responsible for a significant decline in the mortality from pulmonary embolism. There remain, however, certain conditions under which low ligations do not suffice and higher ligations than those of the femoral veins seem the procedures of choice. Thrombophlebitis of the pelvic veins with pulmonary emboli cannot be properly handled with any surgical intervention less radical than ligation of the vena cava.

Ligation of the vena cava is comparable to ligation of either iliac vein, requiring no more anesthesia, exposure, technical skill, or time. For these reasons, the iliac approach has been entirely abandoned by the author.

The operative technique of ligation of the vena cava is described, and the incidence and etiology of postoperative edema of the extremities are discussed.

Abstracts of the case histories of the 13 patients who died and the essential data on the 22 who survived are presented. HERBERT F. THURSTON, M.D.

## BLOOD; TRANSFUSION

**Puyó Villafañe, E.: Intracardiac Transfusion** (Sobre transfusión intracardíaca). *Sem. Méd.*, B. Air. 1946, 53: 874.

The author reports 2 cases of shock in which the patient received an intracardiac transfusion with a successful result.

The first case was that of a 34 year old soldier who had an operation on his knee and collapsed 5 hours later. Adrenalin and citrated blood were injected intracardially. The patient survived only for a few hours. The second case was that of a patient with a wound in his neck and an aneurysm of the subclavian artery who had collapsed; he was given 500 c.c. of physiological solution intracardially and 300 c.c. of blood, with very good results. The patient survived the operation. WILLIAM E. RICKETTS, M.D.

# SURGICAL TECHNIQUE

## OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

**Bohmansson, G., Rosenkvist, H., Thorsén, G., and Wilander, O.: Clinical Experiences with Dextran as a Plasma Substitute.** *Acta chir. scand.*, 1946, 94: 149.

Dextran is a polysaccharide of glucose molecules obtained as a special product in the manufacture of beet sugar. For intravenous use it is purified and its molecular weight is hydrolyzed down to about 100,000. It is used in a 6 per cent solution with a viscosity of 4.5 to 5.2. This solution, when given to human beings, has a tendency to increase the sedimentation rate. No impairment of renal function was demonstrable on the basis of a careful check of the urinary output, specific gravity, excretion of sodium chloride, and urea clearance. Hippuric acid, phosphatase, bilirubin and urobilinogen revealed no impairment of liver function. Erythrocyte, leucocyte and thrombocyte levels were not affected. There was no sensitization due to repeated infusions. Transfusions, intravenous and intrasternal, caused no local phlebitis, and paravenous leakage gave no severe pain. The increase in blood pressure following dextran was due to the increase in circulating volume. In every case of shock treated with dextran the rise in blood pressure was maintained for a satisfactory period of time. Oscillometric readings showed that dextran increased the strength of pulsation and also served to decrease the level of hemoconcentration in shock. About one-eighth of the infused dextran reaches the urine in 4 hours and the remainder is usually excreted in about 24 hours.

The reactions following the injection of dextran were mild—urticaria, chill, a rise in temperature, muscular pains, headache, and lumbar pain occurring occasionally. BENJAMIN G. P. SHAFIROFF, M.D.

**Evans, J. A., and Boller, R. J.: Subcutaneous Heparin in Anticoagulation Therapy.** *J. Am. M. Ass.*, 1946, 131: 879.

The authors report the recent experiences at the Lahey Clinic, Boston, Massachusetts, with the subcutaneous administration of heparin in anticoagulation therapy for cases of postoperative venous thrombosis. In the last 3 years and 10 months only 133 such cases developed in approximately 20,000 major surgical procedures. In 8 of these femoral ligation was performed, without further venous sequelae. This operation was reserved for cases of ambulatory recurrent calf phlebothrombosis with one or more benign pulmonary emboli or postoperative cases in which a second operation had to be performed. In the other 125 cases, treated with anticoagulation therapy, there was only 1 death. During the same period, approximately 40 patients died of sudden pulmonary embolism without warning.

The characteristic effect of dicumarol on clotting—a drop in the prothrombin percentage—is achieved in from 2 to 5 days. During the period of lag, heparin has been given to prolong the coagulation time. Within the last 9 months the intravenous drip method of administering heparin has been discontinued and replaced by the more desirable method of subcutaneous injection. In this procedure Pitkin's menstruum (18% gelatin, 8% dextrose, and from 1 to 1½% acetic acid in distilled water) which releases water soluble drugs slowly, is utilized as a vehicle for the heparin.

The Pitkin's menstruum is supplied in 1 c.c. ampules containing 100 mgm. of heparin and 2 c.c. ampules containing 200 mgm. of heparin. Either ampule may be had with vasoconstrictors added—10 mgm. of ephedrine and 1 mgm. of epinephrine. The authors regard the following as the most effective dosages: for patients under 150 pounds, 1 c.c. without vasoconstrictors and 1 c.c. with vasoconstrictors given simultaneously with the first dose of dicumarol; and for patients over 150 pounds, 1 c.c. without vasoconstrictors and 2 c.c. containing vasoconstrictors. Daily prothrombin percentage determinations guide the dicumarol therapy, and daily coagulation times, the heparin/Pitkin therapy. The dose is repeated if the coagulation time returns to normal before the dicumarol has lowered the prothrombin time to at least 69 per cent. An initial dose of 200 mgm. of dicumarol is given to patients under 150 pounds, and of 300 mgm. to those over 150 pounds. A daily maintenance dose of 100 mgm. is given whenever the prothrombin is over 65 per cent.

Of the 18 patients in the author's series receiving heparin/Pitkin therapy, 9 were given no vasoconstrictor, whereas the other 9 received it. The first group, with no vasoconstrictors, showed an increase in coagulation time within 2 hours. Three patients responded in the first hour. The maximal effect took place between 12 and 24 hours later, and the average duration of the effect was 41 hours. The second group showed approximately the same time of onset of effect and time of maximal effect. However, there was a greater duration of the effect in these cases, the average being 61 hours. When the heparin/Pitkin therapy was given in a ratio of 200 mgm. with vasoconstrictor to 100 mgm. without, a marked prolongation of effect was attained, up to 108 hours in 1 instance. This result is more to be desired in cases in which heparin is being given alone than in those in which it is merely given during the latent period in dicumarol therapy.

Occasional side effects of heparin/Pitkin administration are mild and usually require no treatment. They consist of local pain, swelling, and tenderness. Symptoms of palpitation and mild vertigo, caused by the vasoconstrictors, subside within an hour without treatment.

The authors conclude that heparin administered subcutaneously in Pitkin's menstruum, with or without vasoconstrictors, is an effective agent in anticoagulation therapy. B. F. LOUNSBURY, M.D.

**Bauer, G.: Heparin in Venous Thrombosis.** *J. Am. M. Ass.*, 1946, 131: 196.

In the summer of 1940, a new method for the treatment of thrombosis of the deep vein of the leg was introduced at the Mariestad Hospital in Sweden. In preliminary investigations, phlebograms were performed on nearly 600 patients. In 246 of these patients, studies were made of acute deep thrombosis; in another equally large group, the chronic stage of the disease was studied. About 130 phlebograms and dissections were made to ascertain the normal anatomy of the veins of the leg.

It is now almost generally agreed that thrombophlebitis is a primary disease of the wall of mainly the subcutaneous veins, secondarily followed by thrombotic obliteration. On the other hand, in the deep veins of the leg, the clotting of the blood is the primary factor, and only secondarily the wall of the vein becomes involved. Acute thrombosis of the deep veins, or phlebothrombosis, are the terms for this process. About 250 phlebographic studies have shown that the process begins with a thrombus arising in a muscle vein and projecting into one of the larger veins where it becomes the starting point of a deposition thrombus; the latter continues growing upward in the direction of the blood stream for 40 to 50 mm., gradually occluding the entire lumen.

The thrombus is anchored only at its lowermost end far down in the lower part of the leg. Within 24 to 48 hours the thrombus either gives rise to an embolus or, more often, it fills completely the femoral vein and becomes attached to it, giving rise to phlegmasia alba dolens. This course was proved by phlebography which also revealed an occurrence of thrombosis in the other leg in at least 30 per cent of all untreated patients. Recanalization of the thrombosed veins seldom occurs.

For the rest of the patient's life the drainage of the venous blood from the lower part of the leg is taken care of by the saphenous and an accessory system of subcutaneous veins. A mild state of venous stasis occurs and, due to overloading, the superficial veins undergo degeneration and distention, and their valves become defective. This in turn increases the stasis in the lower part of the leg and leads to induration and ulceration of the skin. Leg ulcers, thought to be due to varices, were found, in 80 to 90 per cent of cases, to be due to deep thrombosis, and therefore the term post-thrombotic ulcer is proper. Deep thrombosis has ultimately led to permanent swelling of the leg, in more than 90 per cent of patients to indurative lesions, and in about 80 per cent to leg ulcers. Early diagnosis is highly desirable in order to prevent fatal pulmonary embolism by vein ligation or anticoagulant therapy. The latter, if used early, stops the thrombotic process in the lower leg, thereby preventing late thrombotic sequelae.

None of the early clinical signs, such as rise of pulse, of temperature, or swelling, or tenderness over the calf are absolutely indicative of thrombosis unless confirmation is had by phlebography. No patient was treated by the author without x-ray confirmation of the diagnosis. The interpretation of x-ray pictures does not give rise to difficulties, provided careful technique is observed, and some experience is at hand.

In an initial group of 29 cases in which phlebography disclosed incipient thrombotization of the lower part of the leg, no heparin therapy had been used as yet. In 24 of these cases, spread to the femoral vein and the development of phlegmasia alba dolens were shown. Pulmonary embolism occurred in 11 cases, and proved fatal in 2. In 10 cases the thrombosis was bilateral. High femoral vein ligation was performed in 2 cases with pulmonary infarction.

The knowledge of the late results of thrombosis, when the popliteal and femoral veins were involved and put out of function, was a warning against the continued use of femoral vein ligation, and it was therefore decided to try heparin.

The prophylactic use of heparin was ruled out, and its use in fully developed thrombosis did not appear promising. Results with heparin in early thrombosis were favorable and the entire course of the disease was changed: there was no spread of thrombosis; fever, pain and swelling subsided in a short time and the patients left their beds in less than a week. The treatment consisted of (1) early diagnosis; (2) immediate intensive heparinization; (3) movements of the leg from the beginning; (4) getting patient out of bed as soon as acute symptoms disappear, and before the termination of heparin injections.

Heparin was administered by intermittent intravenous injections; 150 mgm. of heparin was given as the initial dose, followed by 1 or 2 equal injections every 4 hours, the last dose given late at night. On the following day, 3 or 4 injections were given with early morning and night doses of 150 mgm. and 1 or 2 mid-day doses of 100 mgm. After a few days the temperature returned to normal, and swelling and palpation tenderness disappeared. The patient was then allowed out of bed, and the heparin dose was reduced to 100 mgm. twice daily and was discontinued after 1 or 2 days. When leaving bed, the patient was provided with an elastic bandage or a Unna's paste stocking covering the foot and lower part of the leg, for a period of 2 to 3 weeks.

It was found to be of utmost importance that the patient get out of bed before heparinization was terminated. In one case, for instance, disregard of this rule apparently resulted in death. It should be stressed that when heparin is no longer being administered the patient is, on the following day, totally unprotected against fresh thrombosis. The average stay in bed was 4.7 days after starting heparin therapy, as compared with 40 days in the control group.

Getting out of bed may not be feasible in some cases, as in fractures of the lower extremities. Pro-

tracted heparin treatment was then used and tension and relaxation exercises were performed in bed, even under a cast. In the protracted heparin treatment, heparin was given every other evening during the second week and every third evening for another week, and then discontinued. It was assumed that the body had by then adapted itself to the new condition. In none of the 22 patients thus treated was any recurrence observed.

In cases with massive pulmonary embolism larger doses were used, i.e., 150 mgm. every 4 hours. An antispasmodic was also given.

If a phlegmasia alba dolens was already manifest, as in patients previously treated by practitioners, treatment was materially the same. In some cases response was fast; in others somewhat larger doses and more prolonged treatment was necessary.

During a period of 5 years, from 1940 to 1945, 209 cases of acute thrombosis of the deep veins of the leg were treated. In almost all cases the diagnosis was verified by phlebography. In a comparative series of 264 cases of thrombosis observed during a period of 10 years, there were 47 deaths. On the other hand, of the treated patients, only 3 out of 209 died; thus the mortality after heparin treatment dropped from 18 per cent to 1.4 per cent. Likewise, the mortality from pulmonary embolism dropped from 0.2 to 0.018 per cent. The following comparison is made of the thrombosis material at Mariestad Hospital, Sweden, during a 10 year period when an old fashioned treatment was used, and a 5 year period when heparin treatment was used.

| | 1929–1938 Conservative treatment | 1940–1945 Heparin treatment |
|---|---|---|
| Number of patients admitted | 25,628 | 16,495 |
| Number of thrombosis cases | 264 | 209* |
| Fatal embolism | 47 | 3 |
| Mortality among thrombosis cases | 18% | 1.4% |
| Total mortality from thromboembolism | 0.2% | 0.018% |

*Of these, 79 patients (two fifths) were admitted because of thrombosis which had been contracted in their homes or at other hospitals, but had not received any treatment.

Contrary to general belief, no intra-abdominal, subcutaneous, or other serious bleedings, were encountered with heparin, except for hematuria which was seen in 3 cases, lasting only 2 days, and was not followed by any renal irritation. It passed off without necessitating discontinuation of the heparin regime, or even reduction of the dose. In 2 cases a mild bleeding into the knee joint occurred after operation for a lacerated meniscus. Thus there appears to be no contraindications to the use of heparin, and diseases of liver, kidney, or other parenchymal organs are not badly influenced. Puerperal bleeding was not affected, and existing traumatic hematomas were not enlarged.

It is highly probable that a large majority of heparin-treated patients will escape troublesome after effects which have been regularly observed in conservatively treated thrombosis patients who develop permanent leg swelling, and later brown induration and ulcers. ARTHUR J. LESSER, M.D.

## ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

**Perez, M.: Experimental Study of the Pathogenesis of the General Syndrome of Burns** (Ricerche sperimentali sulla patogenesi della sindrome generale da scottatura). *Arch. ital. chir.*, 1945, 67: 343.

The pathogenesis of the general syndrome of burns was studied in dogs. Under ether anesthesia the sciatic, obturator, and femoral nerves were resected. In order to avoid traumatic shock, novocain was injected into the nerve trunks before they were severed. A segment of each nerve, 2 cm. long, was resected and, in addition, a periarterial sympathectomy of the femoral artery was performed. In one series of experiments the procedure was supplemented by a bilateral lumbar sympathectomy done via the transperitoneal route. Ten days later a burn was produced by immersing one of the lower extremities in hot water.

The general condition of the pulse, blood pressure, respiration, body temperature, and blood picture of the animals, was recorded. The author concludes from his observations that denervation of the burned extremity does not modify the general syndrome of a burn. Phenomena related to the increase of the concentration of the blood in the capillaries are of a reflex origin.

The general syndrome of a burn is due to the entry of toxins from the burned area into the circulation. Such toxic substances affect chiefly such organs as have antitoxic functions. JOSEPH K. NARAT, M.D.

# PHYSICOCHEMICAL METHODS IN SURGERY

## ROENTGENOLOGY

**Esguerra Gomez, G.: Roentgenography and Tomography of the Larynx** (Radiografía y tomografía laríngeas). *Bol. Clín. Marly*, 1946, 8: 58.

The author makes a comparison of the roentgenographic and tomographic procedures in the diagnosis of diseases of the larynx in 5 cases. He concludes that both procedures are very useful, and that their associated use gives better information than each procedure alone. WILLIAM E. RICKETTS, M.D.

**Gershon-Cohen, J.: The Phantom Nucleus Pulposus.** *Am. J. Roentg.*, 1946, 56: 43.

The author reports 3 cases in which he noted a slitlike region of decreased density within the intervertebral space between the fifth lumbar and first sacral segments and 1 case in which such a region was found also between the fourth and fifth lumbar vertebrae. He believes the appearance ascribable to a "phantom nucleus pulposus," i.e., a vacuum in the intervertebral disc resulting from loss of the nucleus pulposus, as hypothecated by Knutsson in 1942.

Each of these patients had sustained an injury many years earlier which had resulted at once in low back pain severe enough to incapacitate the patient for several weeks in the absence of positive neurological signs or of evidence of fracture or dislocation. Two of the patients had had occasional recurrence of the low back pain. Each of them on recent physical examination showed slight limitation of motion at the lumbosacral joint without other signs, but there was roentgen evidence in each case, in addition to the phantom nucleus, of from minimal to moderate subchondral osteosclerosis localized to the lumbosacral region and associated with only slight narrowing of the intervertebral space.

The author believes that these localized hypertrophic osteoarthritic changes point to old injury in the affected region, and suggests that the phantom nucleus is another residuum of the injury at the time of which loss of nuclear substance presumably took place through a defect in the cartilage plate due to rupture of the annulus fibrosus. He believes it may prove a useful diagnostic sign of such disc injury in cases too recent to show accompanying subchondral osteosclerotic changes.

LILIAN DONALDSON, M.D.

**Epstein, B. S., and Davidoff, L. M.: The Use of Laminagraphy with Encephalography in the Diagnosis of Midline and Subtentorial Brain Tumors.** *Am. J. Roentg.*, 1946, 55: 675.

The authors recommend the use of laminagraphy as a routine procedure in pneumoencephalographic study in the diagnosis of midline and subtentorial brain tumors. During the past 2 years over 100 laminagraphic examinations were performed. The findings of pneumoencephalogram and of laminagram examinations of 30 controls and 15 cases which had tumors encroaching on the midline structures were compared in a table to demonstrate the superiority of laminagraphic visualizations over that of encephalograms. The usual standard exposures of the skull are taken before laminagraphic examination. The technique consists of taking a center cut laminagram and cuts 1 cm. to the right and 1 cm. to the left of the midline with the head positioned as for a lateral roentgenogram. Other studies are made as required by the individual patient. The structures which have been more satisfactorily visualized (Fig. 1) are the third ventricle, the aqueduct of Sylvius, the fourth ventricle, and the cisterna pontis.

The roentgenological localization of tumors of the midbrain, pons, cerebellum and adjacent structures rests on the effect of these on the midline structures as visualized by means of gas. The differential diagnosis between posterior fossa or midbrain tumors and inflammatory lesions occluding the aqueduct of Sylvius or the foramina of Magendie and Luschka may be very difficult, and often depends on adequate visualization of these structures. The basic criteria are filling or nonfilling of the ventricles, ventricular displacement or dilatation, and the demonstration of intraventricular shadows. Intraventricular tumors may arise from the ependymal linings (ependymomas), from the neuroglia close to the ventricles (gliomas), or from the choroid plexus (papillomas). Colloid cysts, which seem to occur only in the third ventricle, may spring from the paraphysis. Meningiomas may arise from the tela choroideae. These may manifest themselves roentgenologically as both intraventricular defects and displacement of the ventricles. Absence of filling of the third ventricle with adequate visualization of the lateral ventricles is considered strongly suggestive of intrinsic disease, but nonfilling of the fourth ventricle is much more difficult to evaluate. Lateral displacement of the third and fourth ventricles by supratentorial masses such as low parietal or temporal lobe tumors must not be confused with infratentorial or midline masses.

Tumors arising from neighboring structures may invaginate into the adjacent air filled structures. Among these are Rathke's pouch tumors, chiasmal tumors, pinealomas, aneurysms of the circle of Willis or its main branches, gliomas of the basal ganglia and the quadrigeminal plate, and suprasellar or olfactory groove meningiomas. Adamantinomas completely blocking the third ventricle have been described.

Stenosis of the aqueduct of Sylvius on a congenital, inflammatory, or obstructive basis must also be considered when this structure is not visualized during pneumoencephalography and when the lateral and third ventricles are dilated. Hydrocephalic dilatation of the anterior aspect of the third ven-

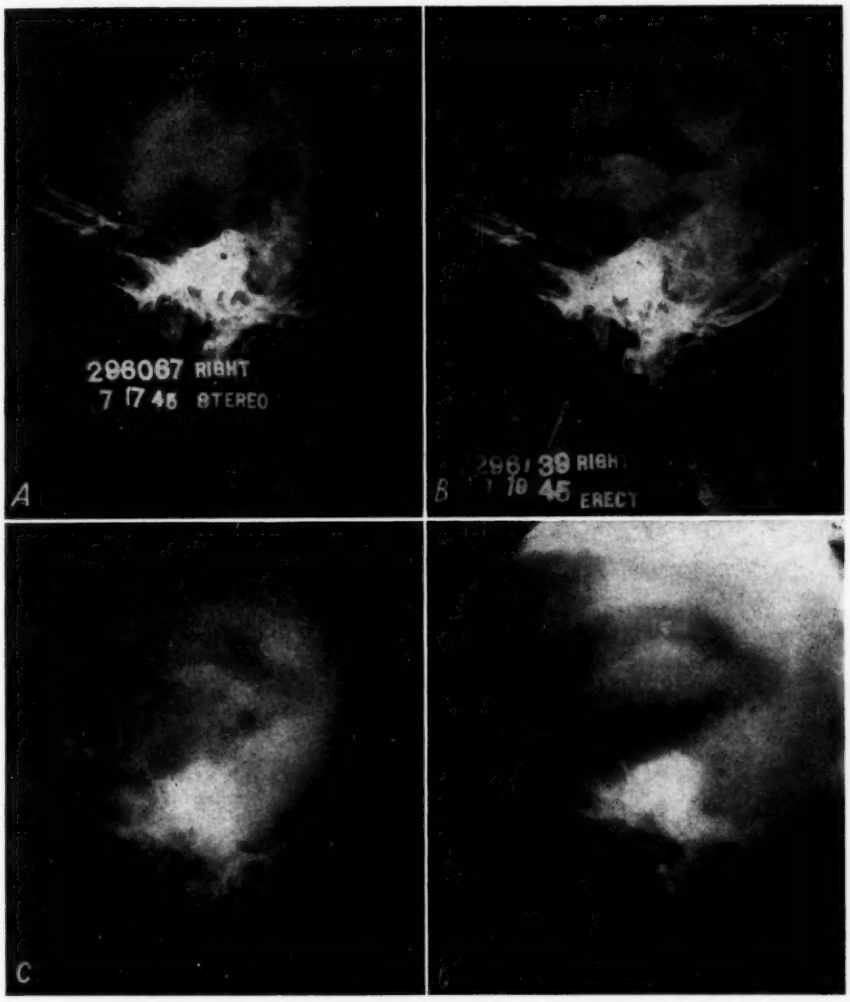



Fig. 1. (Epstein and Davidoff) A, Lateral roentgenogram of the skull reveals atrophy of the dorsum sellae. The floor of the sella cannot be identified. B, Lateral ventriculogram shows moderate dilatation of the lateral ventricles. A soft tissue mass protrudes into the cisternae chiasmaticus and interpeduncularis from the region of the dorsum sellae. The third and fourth ventricles are poorly outlined. The sella is the same as noted in A. C, The lateral midline laminagram reveals the fourth ventricle in its normal position. The third ventricle is not seen. The disappearance of the floor of the sella turcica is strikingly portrayed, and the soft tissue tumor occupying the sphenoidal sinus is readily apparent. The anterior wall and floor of the sphenoid bone are intact. D, Off-center laminagram outlines the entire third ventricle and the upper aspect of the aqueduct of Sylvius. The fourth ventricle is not seen on this laminagram. A chromophobe adenoma of the pituitary was found at operation.

tricle resulting in enlargement of the sella turcica must be borne in mind when the differential diagnosis of intrasellar tumors is considered. Inasmuch as the anterior wall of the third ventricle is thinnest, dilatation of that structure may cause it to balloon downward and forward; it then exerts pressure on the sella and produces enlargement and atrophy. Cerebellar tumors arising from the midline, such as

hemangioblastomas, may displace the aqueduct of Sylvius anteriorly. Tumors arising from its inferior aspect may produce dilatation of the aqueduct as well as of the anterior portion of the fourth ventricle, while tumors springing from its superior surface may result in dilatation of the aqueduct and compression of the fourth ventricle. A shift of the fourth ventricle to either side may aid in lateral localization. Intraventricular tumors may be visualized as such if the cavity is not obliterated.

Pontine tumors may be diagnosed pneumoencephalographically by dorsal displacement of the fourth ventricle and aqueduct and narrowing of the cisterna pontis as the result of a mass within the pons. From the roentgenographic viewpoint the diagnosis rests on adequate visualization of these structures. Cerebellopontine atrophy results in an increase in the size of the neighboring cisterns. When present, it may be diagnosed because of the dilatation of these structures as represented pneumoencephalographically.

Six case reports illustrating the importance of visualizing both cisterna pontis and fourth ventricles by laminagraphy versus the lack of visualization by encephalography were presented.

FRANK L. HUSSEY, M.D.

**Scott, W. G.: Radiographic Diagnosis of Prolapsed Redundant Gastric Mucosa into the Duodenum, with Remarks on the Clinical Significance and Treatment.** *Radiology*, 1946, 46: 547.

The author believes that prolapse of gastric mucosa into the duodenal bulb is of clinical significance. This condition occurred in 14 (1.04%) of 1,346 cases in which roentgenological examinations of the upper gastrointestinal tract were made. These examinations were made in a Naval hospital to which mainly patients with gastrointestinal lesions were sent. Three cases were proved by operation. Additional cases, not included in this series, in which this condition was seen at operation are described.

The principal symptoms in these 14 cases were as follows: intermittent epigastric distress; cramping pains (14); relief from food (10); sense of fullness, bloating, and heartburn (9); and nausea and vomiting (4). Most of the patients had 2 or more of these symptoms.

Additional complications were: positive gastrointestinal bleeding (3); gastric retention (1); coexisting duodenal ulcer (1); and coexisting gastric ulcer (1).

The roentgen diagnosis consists mainly of the demonstration of the characteristic mushroom or cauliflowerlike filling defect in the base of the duodenal bulb, which must not be confused with a deformity of the bulb due to ulcer.

Differential diagnosis must also be made from gastric ulcer (on clinical grounds), duodenitis, prolapsed pedunculated gastric tumors and polyps, papillomas of the duodenum, hypertrophy of the pyloric muscle (adult type), hypertrophic gastritis, and the normal concave shape of the duodenal bulb when viewed obliquely from the base.

The recommended treatment is surgery (excision and pyloroplasty) for severe cases, especially those with bleeding, and medical management for the others.

GERHART S. SCHWARZ, M.D.

# MISCELLANEOUS

## CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

**Peters, F. M.: A Disease Resulting from the Use of Pneumatic Tools.** *Occup. M.*, 1946, 2: 55.

Blood vessel disturbances, affections of muscles, with atrophy and injuries to the bones and joints, have been observed in workers since the introduction of pneumatic tools into French mines, in 1839. Vibration was found to be the primary causative factor, and it has been shown that the critical vibratory rate for the onset of this condition is between 2,000 and 3,000 revolutions per minute.

The author presents a detailed study of 29 workers who developed disturbances after an average interval of 19 weeks, following the use of pneumatic tools capable of developing 25,000 revolutions per minute. Of about 1,000 people employed on the production of B-29 bombers, 116 presented themselves with symptoms which were markedly different as compared to those previously reported. Only that hand holding the tool was affected.

The pain was constant rather than intermittent and was worse in those fingers most intimately in contact with the tool. Most workers experienced radiation of pain to the arm or shoulder and all noticed a stiffness and weakness in the hand and the fingers. None noticed a change in color, but most of them experienced swelling. Cold seldom accentuated the symptoms. Most of the patients exhibited various degrees of anxiety about the condition and had become nervous and hostile.

Although there were no reflex changes, most of the patients exhibited abnormal sensory and neurologic findings in that portion of the hand in closest contact with the tool. Blood pressure, arterial pulsation, and oscillometric readings were all within the range of normal. The finger pulse volumes, as recorded by a plethysmograph, revealed abnormally low pulsations, indicating a predisposition to vasomotor disturbance. A thermocouple was used to measure the temperature and a marked lowering was discovered in the affected fingers. Microscopic study of the capillaries in the nail bed revealed morphologic changes in most instances with a decided decrease in number of capillary loops. The roentgenological and laboratory findings were practically always within the range of normal.

Medical and physical therapy have not proved encouraging; neither has preganglionic section of the thoracic sympathetic chain. Therefore, prophylaxis is at present the only rational approach, viz., (1) limitation of vibration under the critical level, (2) dampening the vibration, (3) limitation of the length of use of the tool, and (4) mechanical devices to hold the tool.

The author suggests that fatigue may appear if the capillaries are subjected to many rapid, repetitive blows, and that if these continue unabated, death of the tissue itself may eventuate.

DAVID H. LYNN, M.D.

**Hirsh, H. L., Feffer, H. L., and O'Neil, C. B.: A Study of the Diffusion of Penicillin Across the Serous Membranes of Joint Cavities.** *J. Lab. Clin. M.*, 1946, 31: 535.

Many joint infections are known to be caused by bacteria sensitive to penicillin. A study was made in order to determine penicillin exchange between blood and joint fluid as a prerequisite for the treatment of purulent arthritis.

Penicillin was injected into the knee joint or administered systemically; assays were made on joint fluid and serum in order to determine the rate of diffusion across the serous membrane of the joint. Some patients received fever treatment during this procedure. The patients studied had rheumatic fever, rheumatoid, gonococcic, and other pyogenic arthritides. One hundred cubic centimeters of physiologic salt solution was injected into the knee joint and reaspirated for penicillin assay. No difference was found between sodium and calcium salts of penicillin G, calcium salts of penicillin X, or sodium crystalline penicillin. Penicillin was given by mouth in tablet doses of 100,000 units every 2 hours, by continuous intravenous infusion of 100,000 to 200,000 units for periods of from 6 to 12 hours, and by intermittent injection of 20,000 to 80,000 units every 2 hours, or 25,000 to 30,000 units every 3 hours, or 50,000 units every 6 hours; or 200,000 units of penicillin in 20 to 50 c.c. of physiologic salt solution were injected into the knee joint.

If 30,000 to 200,000 units of penicillin were given into the knee joint, penicillin was found present in the knee fluid in from 24 to 120 hours, depending on the dose. One hour after each injection penicillin was found present in the blood and was maintained at nearly constant levels throughout the period of observation. The concentration varied from .0195 to .312 units per cubic centimeter. The knee fluid concentrations for from 12 to 24 hours were from 10 to 40 units per cubic centimeter. Only patients with secondary arthralgia showed no evidence of absorption of penicillin from the knee joint.

With extra-articular administration of penicillin (oral or parenteral), joint concentrations from 0.0195 up to 0.078 were found. The amount of penicillin which diffused into the joint cavity was varied and independent of serum concentrations. The diffusion into the joint occurred rapidly, from fifteen minutes after parenteral injection. Fever therapy did not affect the exchange of penicillin between blood and joint. The joint fluid concentrations of penicillin obtained with systemic administration of the drug are frequently insufficient to control the infection. Similarly, insufficient amounts of penicillin are ab-

sorbed from the joint space into the blood stream to care for other sites of infections. It thus appears that in the presence of pyogenic arthritis, intra-articular treatment has to supplement systemic administration.

The local effect of penicillin on serous membranes has been known to be followed by a pleocytosis, and was found to increase the white blood count in the joint fluid for a period of about 48 hours following local injection. ARTHUR J. LESSER, M.D.

**Larsen, B. B.: Pilonidal Cysts and Sinuses: A Technique for Excision and Primary Closure.** *Ann. Surg.*, 1946, 123: 1090.

This report concerns 225 consecutive cases of pilonidal cysts operated on by the various officers and residents in Surgery at the A.A.F. Regional Hospital, Truax Field, Madison, Wisconsin. Since bacterial cultures demonstrated the pilonidal wounds to be sterile at the time of block excision, it was reasonable to expect primary closure to be effective. The results are impressive.

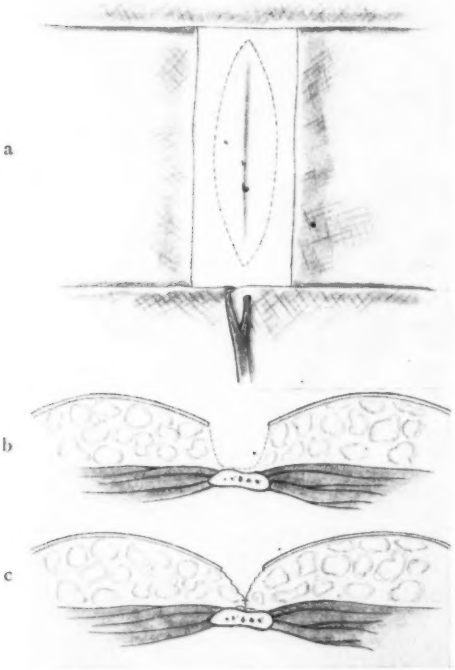



Fig. 1. (Larsen) a, The area is draped with wet towels. The bottom towel is clipped to the skin to protect the field from contamination. b, The block excision must assure a thorough removal of the cyst. Undermining should be avoided. c, Care is taken to place the bottom row of sutures at a level where the deep tissue can be approximated without undue tension. The sacral fascia is never included in the deep suture layer. (Courtesy of J. B. Lippincott Co.)

Primary union occurred in 96.9 per cent of the cases, and only 12 per cent of these were accompanied by minor separation or infection. The few cases that healed by secondary union usually had presented either recent acute inflammation or profuse chronic drainage, and in no instance did more than half of the wound break down. Two hundred and twenty of these cases were followed up for an average of 124 days after surgery and it was found that 87.6 per cent remained healed. None of the others presented a true recurrence of the pilonidal cyst. Moreover, the infection was readily controlled and never involved the deep portion of the wound where a "dead space" is most likely to occur.

In evolving a standardized surgical technique, emphasis was placed on several factors. Acutely inflamed cysts were allowed to "cool off" for 2 or 3 weeks under the usual conservative management. Low spinal anesthesia was used in all cases unless contraindicated. Methylene blue in peroxide was injected into a sinus and the elliptical incisions were carried laterally far enough to include all involved tissue. It was believed that wide defects could be closed without marked tension if the underlying subcutaneous tissue was properly built up. Undermining of the wound edges was scrupulously avoided and the creation of muscle flaps was deemed ill advised.

Closure was performed in layers with a "silk technique" but with #40 cotton, because it produced less wound reaction as compared with catgut. Without including the sacral fascia, the deepest layer of sutures was placed at that level where the fat could be approximated without undue tension. Although this occasionally left a dead space, this was thought to be less serious than placing fat under tension. Usually 2 rows of sutures were sufficient to build up the more superficial subcutaneous fat, attention being exercised to avoid overlapping of the skin edges and to keep the topmost row of sutures from being placed too close to the skin. The skin sutures were placed carefully so as not to penetrate into the subcutaneous tissue as an additional safeguard against bacterial invasion, as this is the most likely mode of postoperative contamination. Because of its hygroscopic as well as its bacteriostatic properties, crystalline sulfanilamide was dusted on the closed incision but not into the open wound. Zinc stearate powder was frequently substituted after 72 hours.

DAVID H. LYNN, M.D.

**Sirtori, C., and Zorzoli, G. C.: Histogenetic Study of Adenolymphomas** (Considerazioni istogenetiche sugli adenolinfomi). *Tumori*, Milano, 1946, 32: 62.

Adenolymphomas are made up of epithelial and lymphoid tissue in varying proportions. They are relatively rare and various names have been given to them; in cases with little lymphoid tissue and multiple cysts the name of lymphomatous adenocystoma is to be preferred. They are almost always located in the lateral region of the neck and the parotid gland,

are benign and grow slowly, and rarely reach a very large size. They are enclosed in a connective tissue capsule and histological examination shows them to be made up of alveolotubular and cystic structures with walls of prismatic epithelium buried in abundant lymphoid tissue.

A typical case is described in a man of 40 with a tumor at the angle of the jaw which in the course of a year reached the size of a small filbert. It was sharply circumscribed, with a smooth surface and a soft pasty consistency, movable on the underlying tissues, and painless. Histologically, it showed lymphoid tissue with germinative centers and epithelial tissue forming tubular and cystic complexes. The epithelium which bordered the cystic and tubular structures was prismatic, sometimes simple but more often stratified and in rows; the cells had an acidophil cytoplasm and a spherical nucleus which stained deeply. No active karyokinesis or atypical cells were seen. In the lumen of the tubes there was sometimes an amorphous substance which was markedly eosinophil and contained cellular detritus and pyknotic nuclei. The lymphoid tissue which formed the stroma of the tubules had the same structure as that of the lymph glands. The germinative centers were not very numerous. The epithelial and lymphoid tissues were distinctly separated from each other by a membrane and there was no intermingling to indicate a possible metastasis from the one form of tissue into the other.

The various theories as to the origin of these tumors are discussed. The theory that they are derived from aberrant rests of salivary glands is rejected. The author believes they are branchiogenic tumors in the broadest sense of the word, with a structure similar to that of the tonsils; they are derived not only from the third branchial cleft but also from the other clefts. AUDREY G. MORGAN, M.D.

## GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

**Pupo, J. A.: Clinical Study of Leishmaniasis Americana of the Skin—Leishmania Brasiliensis—Vianna 1911** (Estudo clínico da leishmanióse tegumentar americana—Leishmania brasiliensis—Vianna 1911). *Rev. Hosp. Clin.*, 1946, 1: 113.

A classification is given of the forms of leishmaniasis. The skin forms include the initial papulovesicular, the papulofollicular, the tuberous, the vegetating, the nodular, and the ulcerous. The mucous membrane forms affect the nose, mouth, and laryngopharynx and may be propagated to the maxillary sinuses. The lymphatic forms include nodular and funicular lymphangitis and lymphadenitis. There are combined cutaneomucous and cutaneolymphatic forms. This disease may cause complications, such as sinusitis, osteoperiostitis, osteolysis, tropical ulcer, skin and mucous membrane myiasis, erysipelas, and elephantiasis nostras.

In general, the disease begins with a papule or nodule which ulcerates and becomes covered with a crust, the removal of which causes bleeding. It may extend rapidly and cause extensive destruction of tissue but it may last for years without causing serious damage to the general health. In some stages it may be confused with syphilis, blastomycosis, or lupus vulgaris, but differentiation is not particularly difficult. A fusospirillary infection may give the ulcers the typical picture of tropical ulcer. In this case the differential diagnosis can be made by means of the Montenegro reaction; general treatment with eparseno heals both the conditions. Local treatment for the fusospirillary symbiosis is given with solutions of sodium hypochlorite, potassium permanganate, or chromic acid, or bismuth salts in the form of salves, associated with salol and camphor. The larvæ of flies may infect the ulcers of leishmaniasis and cause great destruction of the tissue and serious complications. The myiases may be treated with salves and powdered calomel or water saturated with chloroform. Erysipelas is one of the most frequent complications of nasal leishmaniasis, causing a chronic edema and elephantiasis nostras of the eyelids.

The various forms of leishmaniasis are described, the descriptions being based on hundreds of cases seen by the author. Ninety-nine illustrations are given which constitute a very valuable part of the article and give a clearer picture of the different forms of the disease than could be given by verbal description alone. AUDREY G. MORGAN, M.D.

## SURGICAL PATHOLOGY AND DIAGNOSIS

**Roskam, J.: Bleeding Time in Human Beings; Its Utilization for Diagnostic and Pharmacodynamic Purposes** (Le temps de saignement humain. Son utilisation à des fins diagnostiques et pharmacodynamiques). *Rev. belge sc. med.*, 1945, 16: 157.

The author used a slightly modified Duke's method of measurement of the bleeding time, and gives an exact statistical evaluation of his results.

A close correlation was found between the bleeding time of the right and left ear at a room temperature of about 20°C. However, the bleeding time varied

Fig. 1. (Roskam).

considerably, from ½ minute to 3½ minutes, according to the site of the incision in the ear lobe. Therefore, an average should be obtained by making 5 incisions in the ear lobe (Fig. 1).

Two hundred normal subjects were examined in this manner and the average bleeding times and statistical standard deviations were calculated. It was found that all medium bleeding times exceeding 3 minutes should be considered pathological.

ARTHUR J. LESSER, M.D.

**Addis, T., Barrett, E., Lew, W., Poo, L. J., and Others: Danger of Intravenous Injection of Protein Solution after Sudden Loss of Renal Tissue.** *Arch. Int. M.*, 1946, 77: 254.

In cases of shock there may be a sudden loss of effective renal tissue, because for a time the kidney does not get enough blood; more sustained deprivation sometimes occurs after transfusion reactions and there are instances of anatomic as well as functional loss, for instance when part of the kidney is destroyed by shell fragments, and when in glomerular nephritis and symmetrical necrosis of the cortex the majority of the nephrons in a short space of time may become functionless and many may be irrevocably destroyed. For each of these situations there is a specific treatment dependent on knowledge of the causative mechanism, but in all except the most transitory instances of functional loss, the authors believe that the work demanded from the remaining renal tissue should be reduced.

After removal of three-quarters of the total renal tissue from young rats there were no deaths when no protein was taken, but as the amounts of protein consumed increased there was an increasing number of deaths from uremia.

In the survivors there were no signs of renal failure when no protein was taken, but as the consumption of protein increased the concentrations of urea and creatinine in the serum rose toward uremic levels, although at the same time the rates of urea excretion, of urea clearance, of work accomplished, and of new renal tissue constructed were all augmented. This was, therefore, not an absolute renal failure but a failure only in relation to the demand imposed.

An increased demand for work from the kidney is imposed by the parenteral injection of any protein to a degree that varies with its nature and with the conditions under which it is administered.

JOSEPH GASTER, M.D.